

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Overview



For full technical specifications, refer to AppleCare Tech Specs: <http://support.apple.com/specs/>

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Serial Number Location

The serial number for iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013) is located on the bottom of the stand.

When replacing stand, use a fine-tip black permanent marker to neatly write the serial number on bottom of new stand.

iMac (27-inch, Late 2012) Serial Number



General Troubleshooting

Update Software and Firmware

Important: Before you begin troubleshooting, ensure the correct version of OS X is installed, and check for and apply the latest software and firmware updates. Computers sometimes exhibit symptoms that indicate the wrong version of OS X system software is installed. Check Apple Support article [HT1159: Mac OS X versions \(builds\) for computers](#) to make sure system build is correct for this computer model.

Firmware is the name given to software that is written into memory circuits such as flash memory, that will hold the software code indefinitely, even when power is removed from the hardware. Firmware on Intel Mac computers is designed to be updated if necessary by running the OS X Software Update check (available in the Apple () menu) while computer is connected to the Internet.

For more information about firmware updates, refer to Apple Support articles:

- [HT1557: About firmware updates for Intel-based Macs](#)
- [HT1237: EFI and SMC firmware updates for Intel-based Macs](#)

Troubleshooting Theory

For more information about troubleshooting theory, go to [AppleCare Service Training](#) > Courses > Technician > Troubleshooting, and choose [Troubleshooting Theory](#) from the course list.

Hardware vs. Software

To isolate a hardware issue from a software issue, refer to Apple Support article [TS1388: Isolating issues in Mac OS X](#).

To troubleshoot a software issue, refer to the following Apple Support articles:

Mac OS X v10.6 and later

- [HT3258: OS X: About the incompatible software folder](#)

Mac OS X v10.6 and earlier

- [TS1394: Troubleshooting Mac OS X installation and software updates \(Mac OS X v10.6 and earlier\)](#)
- [HT1199: Mac OS X: How to troubleshoot a software issue](#)
- [HT2186: Don't install a version of Mac OS X earlier than what came with your Mac](#)
- [HT2956: Troubleshooting Mac OS X installation from CD or DVD](#)

iMac (2008 and later): Power-On Self Test (POST)

Intel-based Mac computers such as the iMac rely on a combination of tones and blinking LED lights to display Power-On Self Test (POST) error codes.

- If the computer detects out-of-specification or no Random-Access Memory (RAM), the screen will remain black but the computer will beep. This error condition may be due to physically damaged RAM, installing an incorrect type of RAM, or not having RAM installed.
- Some RAM may appear to pass POST, but still cannot be used by the operating system. In this case, the computer will display a gray screen, sound three beeps and repeat beeps until computer is turned off.
- The solution to both of these situations is to first re-seat RAM and test computer again. If RAM fails POST again, remove all installed RAM and test by installing one by one each RAM module that has been verified to work correctly on another computer (i.e., “known-good” RAM) or order new RAM.
- A sequence of tones heard at startup or a no video symptom may also be fixed by temporarily removing/replacing the backup battery.

For more information, refer to Apple Support article: [HT5860: Mac computers: About startup tones.](#)

Quick Check Procedures

Resetting the System Management Controller (SMC)

The System Management Controller (SMC) is a chip on the logic board that controls all power functions. If the computer is experiencing any power issue, such as not starting up, not displaying video, sleep issues, or fan noise issues, resetting SMC may resolve it.

For more information and instructions to reset the SMC on different computer models, refer to Apple Support article [HT3964: Intel-based Macs: Resetting the System Management Controller \(SMC\)](#).

Note for iMacs: If you press the power button while inserting the power cord, the iMac will enter a mode in which the fans run at full speed. For more information, refer to Apple Support article [TS1433: iMac: Fans run at full speed after computer turns on](#).

Resetting Parameter RAM (PRAM)

PRAM stores certain system and device settings in a location that OS X can access quickly. Exactly which settings are stored in the computer's PRAM varies depending on the type of computer as well as the types of devices and drives connected. To reset PRAM:

1. Shut down the computer.
2. Locate the following keys on the keyboard: Command, Option (Alt), P, and R. You will need to hold these keys down simultaneously in Step 4.
3. Press power button.
4. Immediately press and hold Command-Option-P-R keys.
Important: You must press this key combination before the gray screen appears.
5. Hold down keys until computer restarts, and you hear startup chime a second time.
6. Release keys.

For more information, refer to the following Apple Support articles:

- [HT1242: Mac OS X: What's stored in PRAM](#)
- [HT1379: Resetting your Mac's PRAM and NVRAM](#)

Starting Up in Safe Mode

Safe Mode is the state into which you can start up your Mac by performing a Safe Boot. Starting up into Safe Mode does several things that can help troubleshoot and resolve software or directory issues that may exist on the startup volume. To start up in Safe Mode:

1. Make sure computer is shut down.
2. Press power button.
3. Immediately after you hear startup sound, press and hold Shift key.
Note: The Shift key should be held as soon as possible after startup sound but not before.
4. Release Shift key when you see the screen with a gray Apple and progress indicator (looks like a spinning gear). Note that booting into Safe Mode will take longer than a normal startup. During startup in OS X v10.4 through OS X v10.6.8, you will see "Safe Boot" on the login window, which appears even if you normally log in automatically. In OS X v10.6 and later, a gray progress bar is also displayed on the bottom of the window during Safe Boot. During startup in OS X v10.2 through v10.3.9, you will see "Safe Boot" on the OS X startup screen.
5. To leave Safe Mode, restart computer normally, without holding down any keys during startup.

For more information, refer to the following Apple Support articles:

- [HT1564: Mac OS X: What is Safe Boot, Safe Mode?](#)
- [HT1455: Mac OS X: Starting up in Safe Mode](#)
- [TS1884: Safe Boot takes longer than normal startup](#)

Recovering a Lost Firmware Password

Only Apple Retail Stores or Apple Authorized Service Providers can unlock the following Mac models when protected by a firmware password:

- MacBook Air (Late 2010 and later)
- MacBook Pro (Early 2011 and later)
- iMac (Mid 2011 and later)
- Mac mini (Mid 2011 and later)
- Mac Pro (Late 2013)

Refer to Apple Support article [TS3554: Recovering a lost firmware password on Mac computers manufactured after October 2010](#).

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Diagnostic Software

The following diagnostic software is required for troubleshooting iMac (21.5-inch, Late 2012, Early 2013, and Late 2013):

Important: If the Mac was introduced before June 2013, use Apple Hardware Test (AHT) rather than Apple Diagnostics. For more information on Apple Diagnostics, refer to [HT5781: Using Apple Diagnostics](#).

iMac (21.5-inch, Late 2012 and Early 2013)

- **Apple Service Diagnostic (ASD):** version [3S157](#)
- **Apple Hardware Test (AHT):** version [3A244](#)

iMac (21.5-inch, Late 2013)

- **Apple Service Diagnostic (ASD):** version [3S157](#)
- **Apple Diagnostics:** version 1.0.1

Apple Service Toolkit (AST)

AST is a suite of diagnostic tools that checks Intel-based Mac hardware components, and provides detailed diagnostic logs for review. AST runs on a local server, managing multiple Ethernet clients via NetBoot.

For more information, refer to Apple Support articles:

- [OP476: Latest Apple Service Toolkit download links and documentation](#)
- [TP586: AST Reference Guide](#)

Mac Resource Inspector (MRI)

MRI, which is part of AST, is a quick triage tool that checks for the presence of hardware and reports sensor readings. Sensors are located on a variety of parts, including cables, fans, storage devices, power supply, display panel, and logic board. Use MRI to help isolate failures and avoid unnecessary part replacements. MRI complements ASD, which is a more in-depth repair verification tool.

Note: If all AST checks pass and a component is still suspected of fault, then verify with other diagnostic tools.

iMac (21.5-inch, Late 2012, Early 2013) Sensors

Sensor	Suspected part and Location	Suggested Action
IC0C	On logic board	Check cable connections to logic board; test with known-good logic board.
IC0G	On logic board	Check cable connections to logic board; test with known-good logic board.
ID2R	On logic board	Check power supply cable connections to logic board; test with known-good logic board; test with known-good power supply.
IG0C	On logic board	Check cable connections to logic board; test with known-good logic board.
IG0U	On logic board	Check cable connections to logic board; test with known-good logic board.
IH1R	On logic board	Check SSD logic board connection; test with known-good SSD.
IM0R	On logic board	Check SO-DIMMs; test with known good SO-DIMMs; test with known-good logic board.
TA0p	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tb0p	On logic board	Check cable connections to logic board; test with known-good logic board.
TC0p	On logic board	Check cable connections to logic board; test with known-good logic board.
TCXr	On logic board	Check cable connections to logic board; test with known-good logic board.
TG0d	On logic board	Check cable connections to logic board; test with known-good logic board.
TG0p	On logic board	Check cable connections to logic board; test with known-good logic board.
TH0O	Built into the HDD	Check HDD cable connections to logic board; test with known-good HDD.
TH1R	Built into the SSD	Check SSD logic board connection; test with known-good SSD.
TL0p	Mounted to the back of the LCD display	Check LCD cable connections to logic board; test with known-good LCD display; test with known-good logic board.
TL1p	Built into the LCD display	Check LCD cable connections to logic board; test with known-good LCD display; test with known-good logic board.
Tm0p	On logic board	Check cable connections to logic board; test with known-good logic board.
TM0p	On logic board	Check SO-DIMMs; test with known good SO-DIMMs; test with known-good logic board.
Tp2h	Built into the power supply	Check power supply cable connections to logic board; test with known-good logic board; test with known-good power supply.
TPCD	On logic board	Check cable connections to logic board; test with known-good logic board.
VC0C	On logic board	Check cable connections to logic board; test with known-good logic board.
VC0G	On logic board	Check cable connections to logic board; test with known-good logic board.
VD2R	On logic board	Check power supply cable connections to logic board; test with known-good logic board; test with known-good power supply.
VG0C	On logic board	Check cable connections to logic board; test with known-good logic board.
VH1R	On logic board	Check SSD logic board connection; test with known-good SSD.
VM0R	On logic board	Check SO-DIMMs; test with known good SO-DIMMs; test with known-good logic board.

iMac (21.5-inch, Late 2013) Sensors

Sensor	MRI/ASD Name	Description	Sensor Location	Suggested Action
TA0p	Ambient MLB	Ambient temperature	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tb0p	BLC Proximity	Backlight Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board and/or LCD panel.
TC0p	CPU Proximity O	CPU Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TCXr	ACPU Relative Die Sensor	CPU Die	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
TH0O	Hard Drive Proximity	Hard Drive	Built into the HDD	Check for clogged fans and/or vents; check HDD cable connections to logic board; test with known- good HDD, HDD cable and/or logic board.

TH0o	Hard Disk Out of Band	Hard Drive Out of Band	Built into the HDD	Check for clogged fans and/or vents; check HDD cable connections to logic board; test with known- good HDD, HDD cable, and/or logic board
TH1R	SSD 1 OOB max relative	Flash Storage	Built into the SSD	Check for clogged fans and/or vents; check Flash Storage card connection to logic board; test with known- good Flash Storage card and/or logic board
TL0p	LCD Proximity	LCD	Mounted to the back of LCD display	Check for clogged fans and/or vents; check LCD connection to logic board; test with known-good LCD, LCD cable, and/or logic board.
TL1p	TCON Local	LCD Logic board	Built into the LCD display	Check for clogged fans and/or vents; check LCD connection to logic board; test with known-good LCD, LCD cable, and/or logic board.
TM0p	SO-DIMM Proximity	SO-DIMM 1 Proximity	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good memory module and/or logic board.
Tm0p	MLB DIMM Local Board	MLB PSU Local	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tm1p	MLB Proximity 1 (CPU)	MLB GPU Local	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tm2p	MLB Proximity	CPU backside sensor	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
Tp2h	AC/DC T2 Secondary heatsink	Power Supply Secondary Heatsink	Built into the power supply	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good power supply , power supply DC cable, and/or logic board.
TPCD	PCH Die temp	PCH Die	On logic board	Check for clogged fans and/or vents; check cable connections to logic board; test with known-good logic board.
ALSL	Light Sensor	Ambient Light	On Camera board	Check camera cable connections; test with known-good camera, camera cable and/or logic board.
IC0C	CPU 0 Vcore Average	CPU Core Current	On logic board	Check cable connections to logic board; test with known-good logic board.
IC0M	CPU 1.35 S0	CPU 1.35V Current	On logic board	Check cable connections to logic board; test with known-good logic board.
ID2R	AC/DC	DC Current	On logic board	Check DC power cable connections to logic board; test with known-good power supply and/or logic board.
IH05	2.5 HardDrive 5.0V S0	2.5 HD 5.0V Current	On logic board	Check HDD cable connections to logic board; test with known-good hard drive, hard drive power cable, and/or logic board.
IH1R	SSD 3.3V	Flash Storage 3.3V Current	On logic board	Check flash storage card connection to logic board; test with known-good flash storage card and/or logic board.
IM0R	Memory I-Sense	DIMM 1.5V Current	On logic board	Check SO-DIMM memory module connections to logic board; test with known good SO-DIMM memory module and/or logic board.
VC0C	CPU 0 Core	CPU Core Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VC0M	CPU 1.35 S0	CPU 1.35V Voltage	On logic board	Check cable connections to logic board; test with known-good logic board.
VD2R	Power Supply 12V S0	DC Voltage	On logic board	Check DC power cable connections to logic board; test with known-good power supply and/or logic board.
VH05	2.5 HardDrive 5.0V S0	2.5 HD 5.0V Voltage	On logic board	Check HDD cable connections to logic board; test with known-good hard drive, hard drive power cable, and/or logic board.
VM0R	DIMM 1.5 S3	DIMM 1.5V Voltage	On logic board	Check SO-DIMM memory modules connections to logic board; test with known-good SO-DIMM memory module and/or logic board.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Diagnostic LEDs and Test Pads

The iMac (21.5-inch, Late 2012, Early 2013, Late 2013) has four diagnostic LEDs and two pairs of test pads that can help you troubleshoot the computer without removing the logic board.

The coin battery located on the back of the logic board provides power to the real time clock (RTC) and parameter RAM (PRAM) when the computer is not connected to an AC power source. The RTC maintains the date and time, while the PRAM stores information such as speaker volume, screen resolution, startup disk selection, and recent kernel panics. The coin battery is designed to last several years and does not normally require replacement. However, if there are issues with the functions listed above, the RTC and PRAM may need to be reset, or the coin battery may need to be replaced.

1. Diagnostic LEDs

- See full description of LED behaviors below the locator images.

2. Real Time Clock (RTC) Reset Pads

- Shut down and unplug the iMac. Allow approximately 2 minutes for the power supply to discharge.
- Reset the RTC by shorting the pads found in location C shown below. Use the tip of a flat-blade screwdriver to touch both pads at the same time.

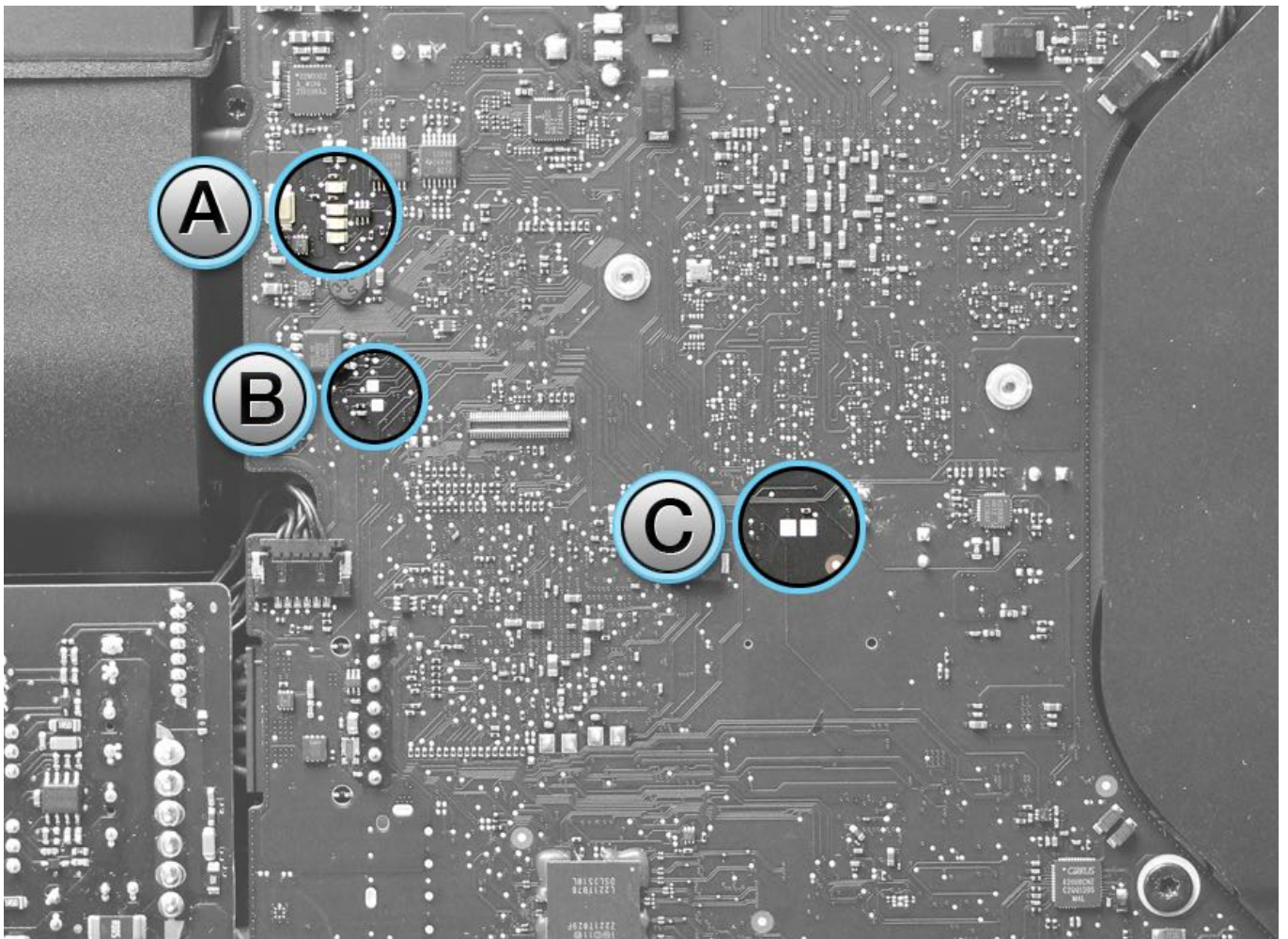
3. Coin Battery Voltage Test Pads

- Shut down and unplug the iMac. Allow approximately 2 minutes for the power supply to discharge.
- Measure the coin battery voltage by using a voltmeter set for DC. Place probes on pads (negative probe - left pad, positive probe - right pad) found in location B shown below. If the voltage is 2.7 volts DC or less, the coin battery should be replaced.

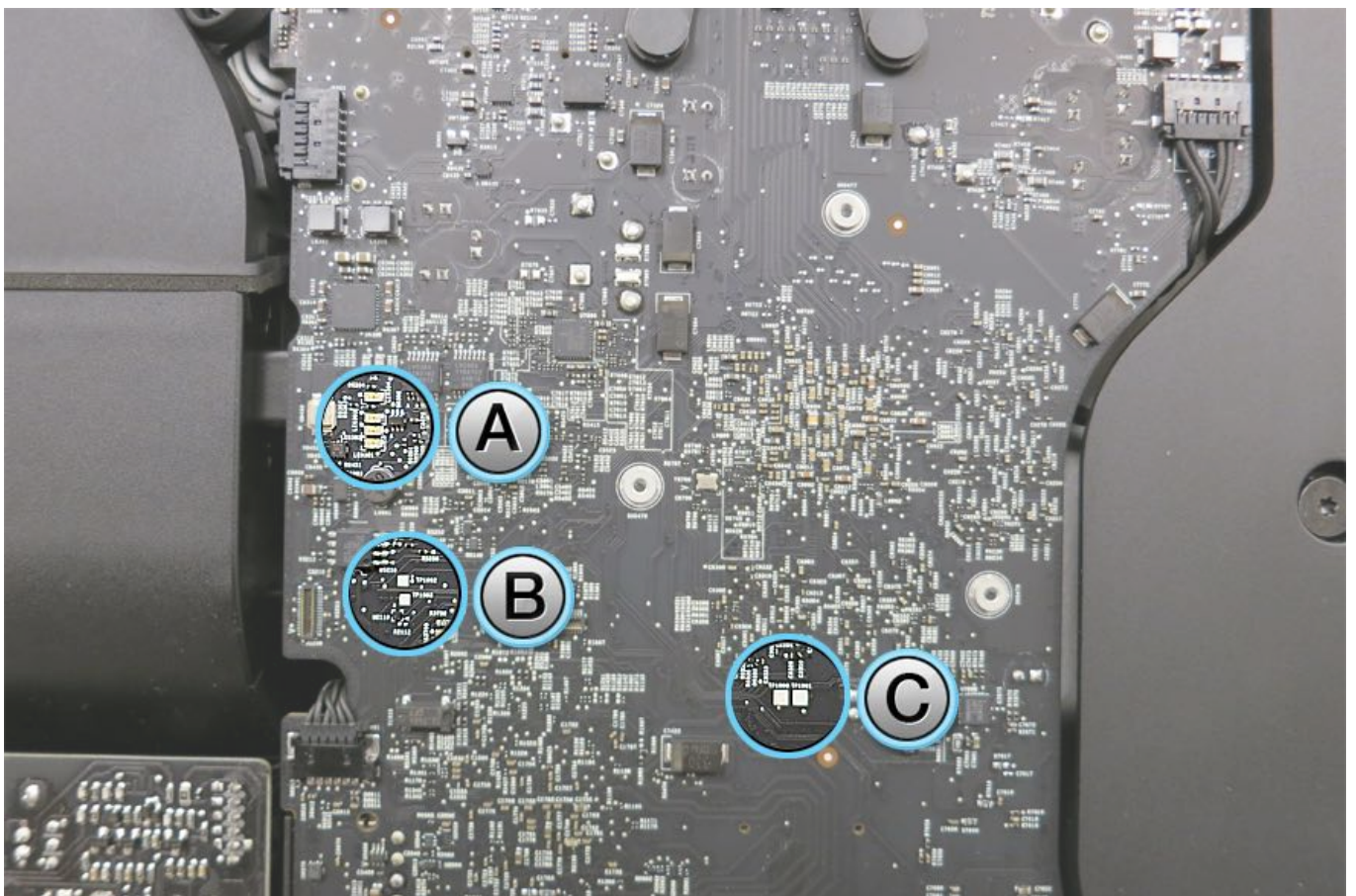


Caution: Be very careful not to touch tools to logic board components other than the test pads.

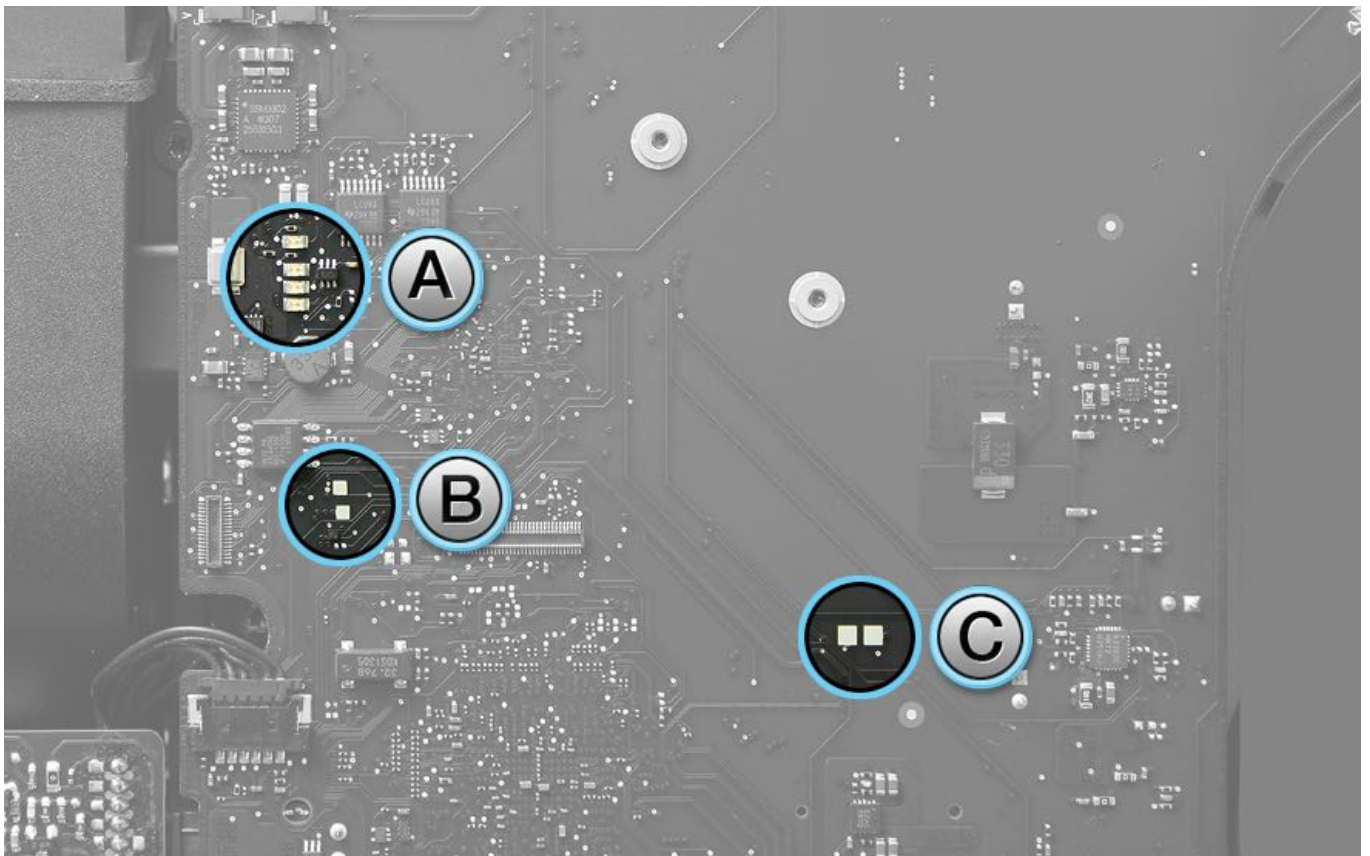
iMac (21.5-inch, Late 2012 and Early 2013) LEDs and Test Pads



iMac (21.5-inch, Late 2013) LEDs and Test Pads



iMac (21.5-inch, Late 2013) LEDs and Test Pads



Diagnostic LEDs (A)

LED 1

- Indicates that the trickle voltage from power supply has been detected by main logic board. This LED will turn ON when you connect the iMac to a working AC power source. LED will remain ON as long as the computer is ON or asleep.
- When computer has been correctly shutdown, LED 1 behavior may differ:
 - If a startup event is scheduled in System Preferences/Energy saver, LED 1 will stay ON after a correct shutdown.
 - If no startup event is scheduled in System Preferences/Energy saver, LED 1 will turn OFF and will stay OFF as long as power cord is kept connected and AC power source is present. Disconnecting the power cord and plugging it back will turn this LED back ON , even if computer is still off.
- After disconnecting and reconnecting the AC power source, this LED could remain OFF if the AC power source is missing or disconnected , if the logic board is disconnected from the power supply or from the AC receptacle, or if the power supply board is faulty.

LED 2

- Indicates that computer is turned on. This LED will be ON as long as computer is turned on (but is not asleep) and power supply and voltage regulators are working correctly.

LED 3

- Indicates that computer and the GPU are communicating. This LED will be ON when computer is communicating properly with the GPU. If LEDs 1 and 2 are ON and you heard the startup sound, but LED 3 is OFF, then the backup battery (on back of logic board) may need to be reseated, or the logic board might need replacement.

LED 4

- Indicates that computer and LCD panel are communicating. This LED will be ON when computer is turned on and video signal is being generated. If LED 4 is ON and there is no image on display, then the LCD panel or the cables between LCD and logic board might be installed incorrectly, or need replacement.

LED Startup Sequence

LED 1 = Power available.

If no LED is visible:

- Disconnect the power cord from computer and wait 15 seconds to reset the power supply and LED status. Reconnect the power cord and check the LED status again.
- Verify AC source.
- Verify known-good power cord is connected.

- Verify cable connection between AC inlet and power supply.
- Verify cable connection between power supply and logic board.
- Verify power supply.

LED 1 + LED 2 = Power available, and system is powered on.

If second LED is not visible when power button is pressed:

- Verify power button connection to power supply.
- Verify power button functionality.
- Verify cable connection between power supply and logic board.
- Verify power supply.
- Verify logic board.

LED 1 + LED 2 + LED 3 = Power available, system is powered on, and GPU found.

If third LED is not visible after power on:

- Verify if boot chime is present and fans are running when powered ON (reset SMC and PRAM, verify backup battery voltage for proper boot up):
 - If POST boot chime is not heard, go to No Startup symptom flow.
 - If POST boot chime is heard, go to No Video symptom flow.

LED 1 + LED 2 + LED 3 + LED 4 = Power available, system is powered on, logic board is communicating with the GPU, and internal LCD found.

If fourth LED is not visible after power on:

- Verify internal DisplayPort cable connections between LCD panel and logic board.
- Inspect LCD display cables for cable damage.
- Verify external video functionality, and according to result check the following items:
 - If external display works then verify/replace the LCD panel.
 - If external display does not work verify/replace the logic board.

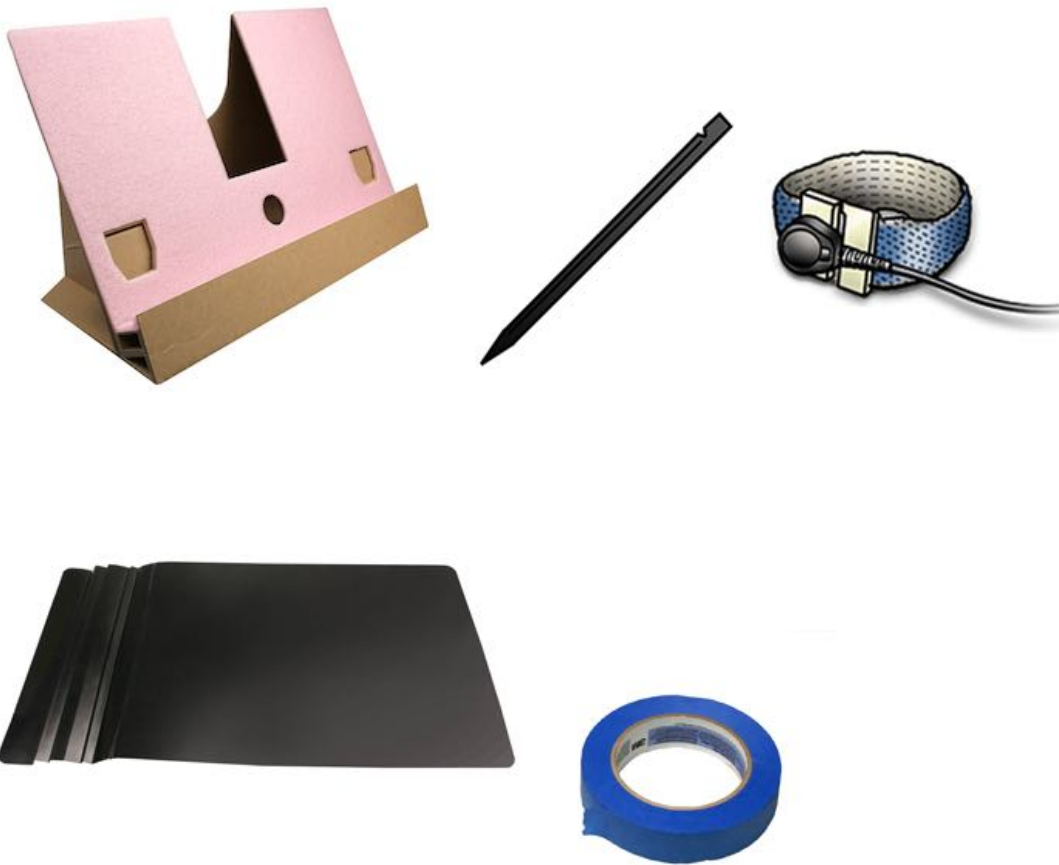
iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Testing the Panel Using the Display Extension Cable Kit

Use the display extension cable kit to:

- Test the system and/or panel prior to securing the panel to the very high bond (VHB) strips
- Test the functionality of the panel's Embedded DisplayPort cable (eDP cable)

Tools

- ESD-wrist strap and mat
- Black stick
- Power supply protective covers x 2 (923-0189)
- LCD service support stand, iMac (923-0416)
- Kit, Display Extension/Substitution Cables (076-1428)
- Painter's Tape





eDP Extension Cable



BLC Extension Cable



eDP Substitution Cable

Procedure #1: Testing the System With the Panel Off, Using Extension Cables

This procedure allows you to test the system with the panel off, to make sure everything is functioning before securing the panel with VHB strips.

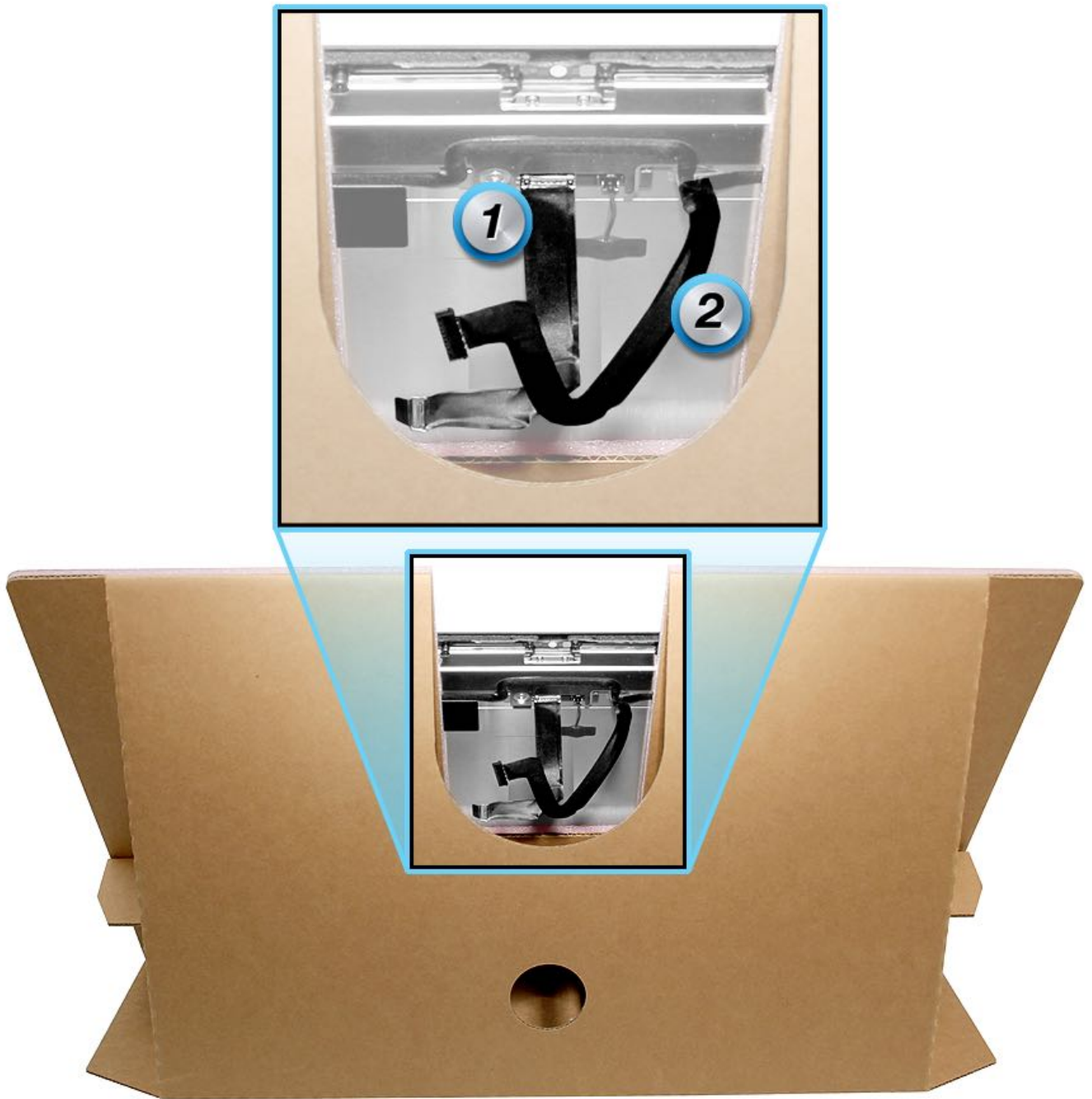
First Steps

- [Display Panel Removal](#)
- [Display Panel - Removing Very High Bond \(VHB\) Strips](#)

1. Place LCD panel on service support stand.



2. Orient service support stand so embedded DisplayPort cable (#1) and LCD backlight cable (#2) are facing you.



3. Locate embedded DisplayPort extension (eDP) cable in kit.

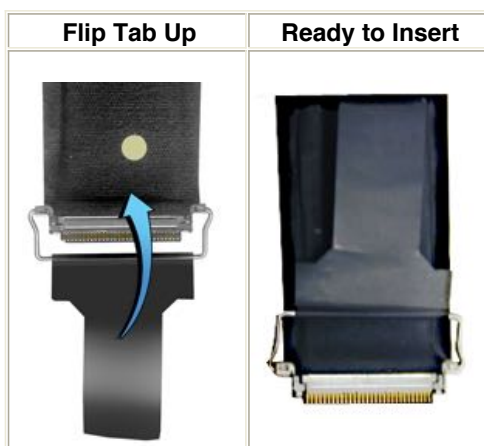


4. **Important:** Each end of the eDP extension cable has a gold dot to indicate cable orientation. Orient cable **gold dot side up** when connecting eDP extension cable to logic board connector and to end of LCD eDP cable. Connecting cables upside-down (with brass connector facing up) will damage logic board and/or LCD panel. **Note:** With proper care, cables will last

approximately **50 insertions**. After 50 insertions, cable degradation may occur and Apple recommends ordering a new Display Extension/Substitution Cable Kit (076-1428).



5. Flip black tab up before connecting eDP extension cable to logic board connector.



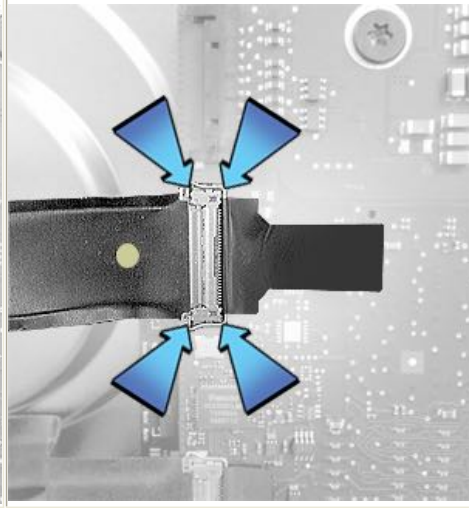
6. Connect extension cable to logic board connector. Cable should be aligned straight on with connector and never inserted at an angle. **Important:** Make sure black tab is attached to locking lever bail on eDP cable. Attaching locking lever without black tab may cause damage to logic board and/or LCD panel.

- Verify cable has gold dot side up.
- Check that connector is fully seated.
- Flip black tab over.
- Press locking lever to secure cable to logic board.

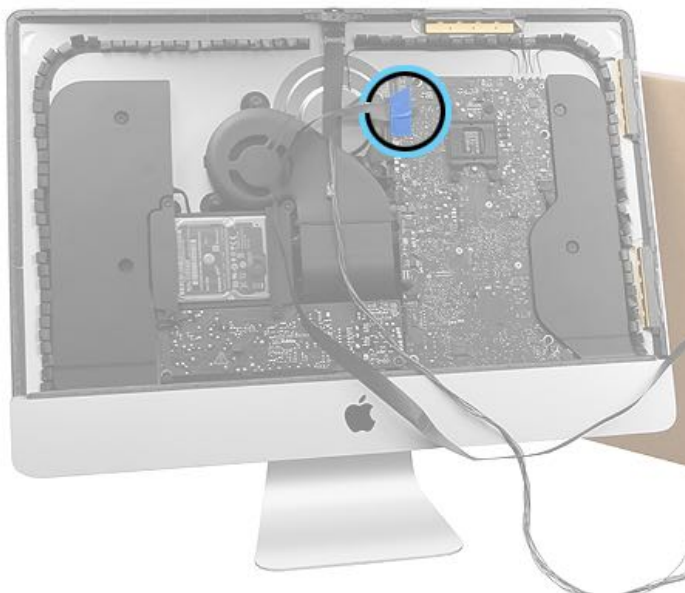
Insert eDP Extension Cable into Logic Board Connector



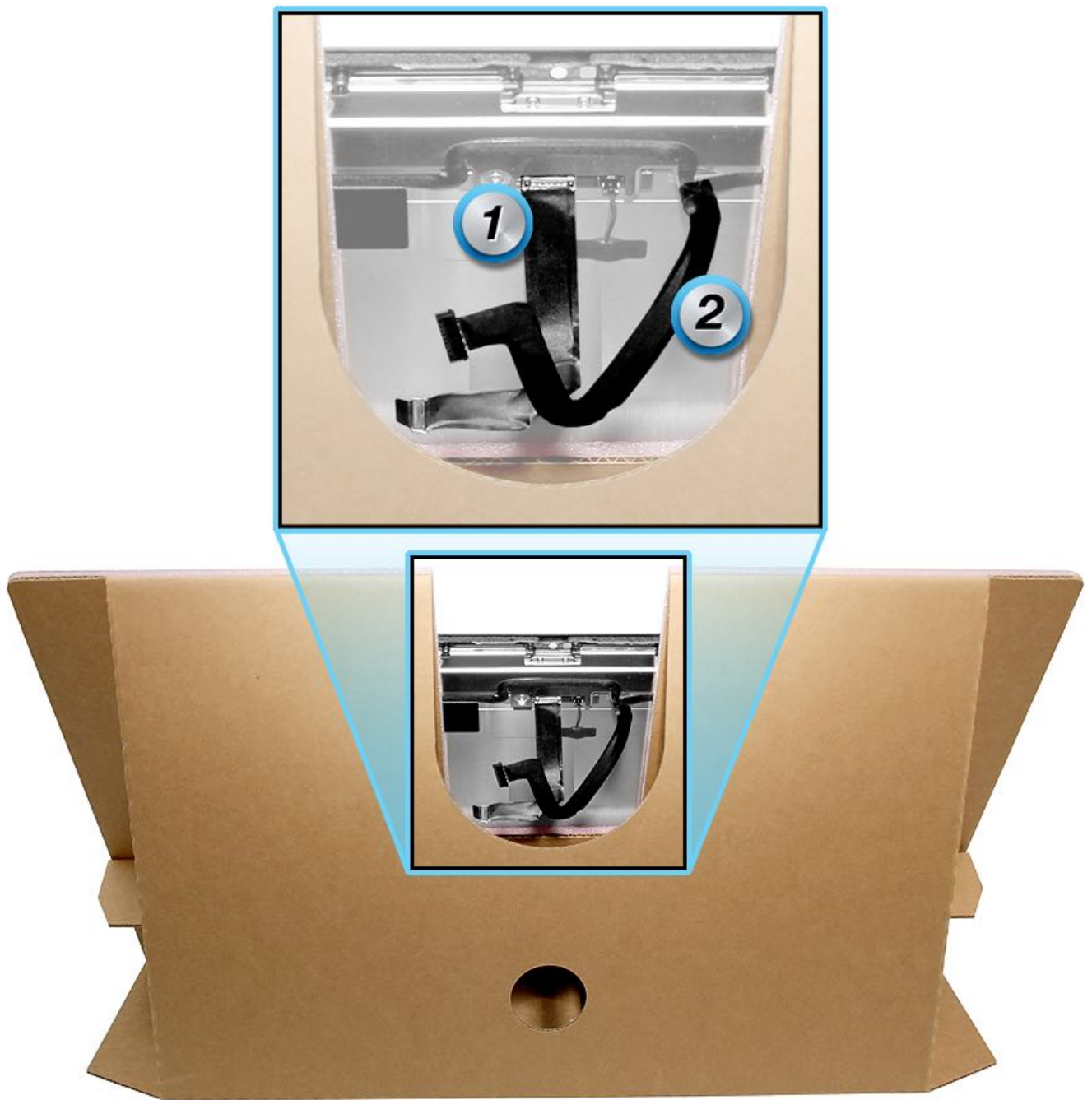
Flip Black Tab and Press Locking Lever To Secure eDP Extension Cable to Logic Board



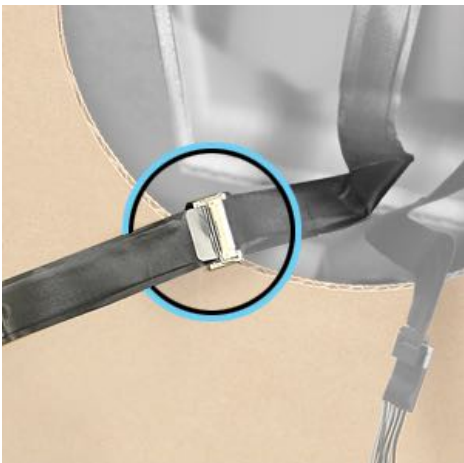
7. Secure eDP extension cable to logic board with painter's tape.



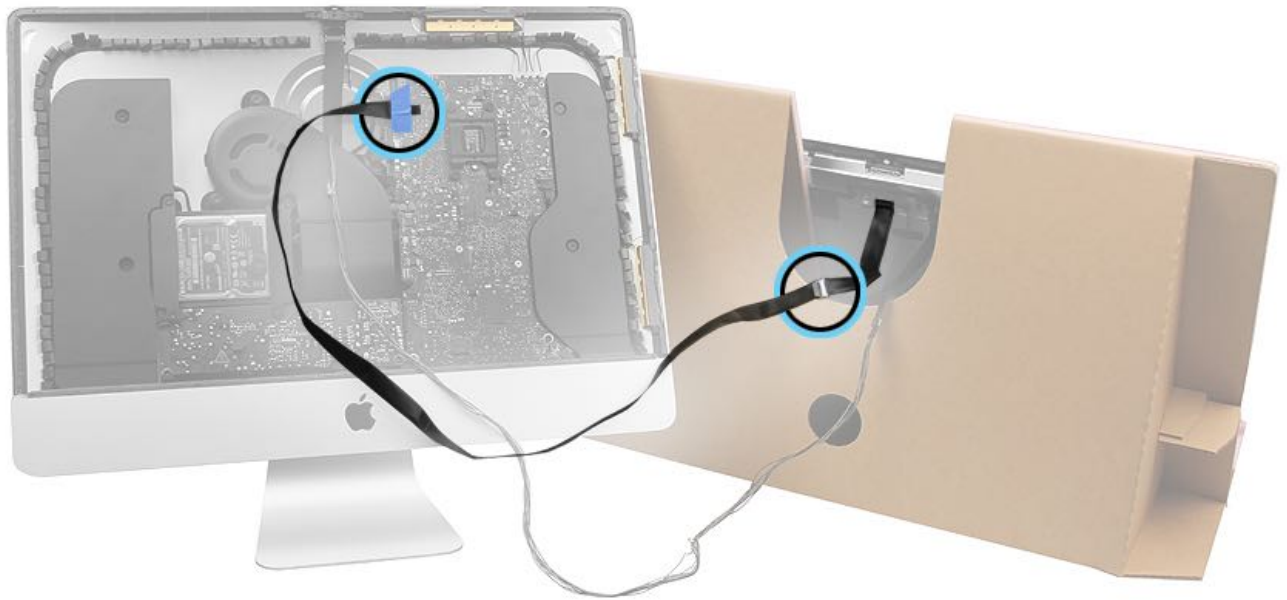
8. Connect other end of eDP extension cable to end of DisplayPort cable (#1).



9. Securely mate cable connectors properly. Flip black tab over and press locking lever bar around connector to secure cables.



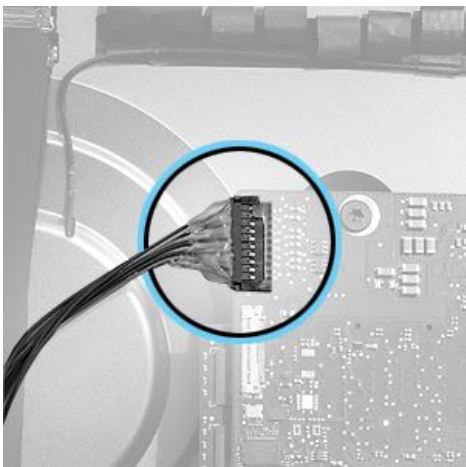
10. The eDP extension cable should look like this when connected properly.



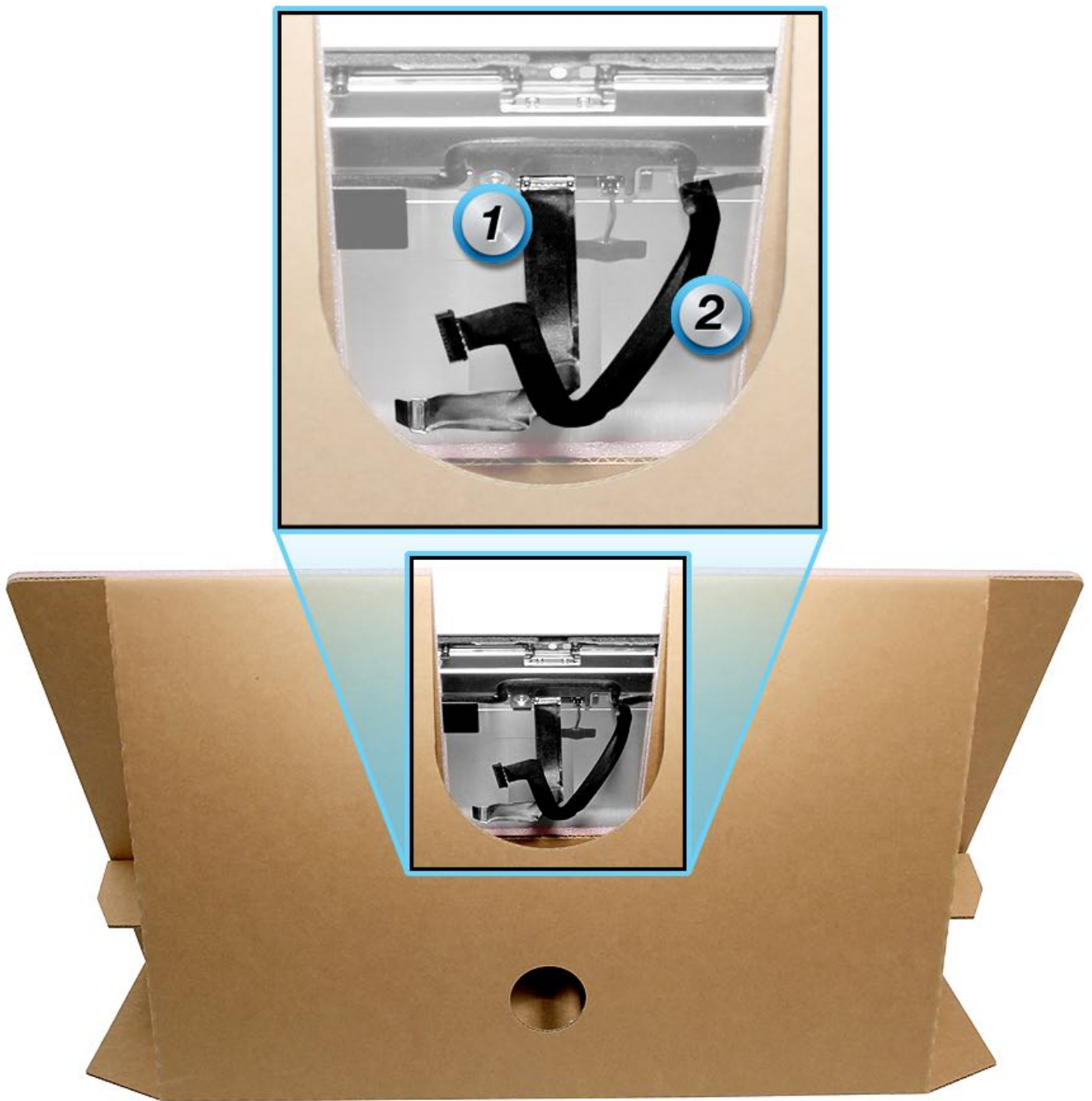
11. Next, locate backlight extension (BLC) cable.



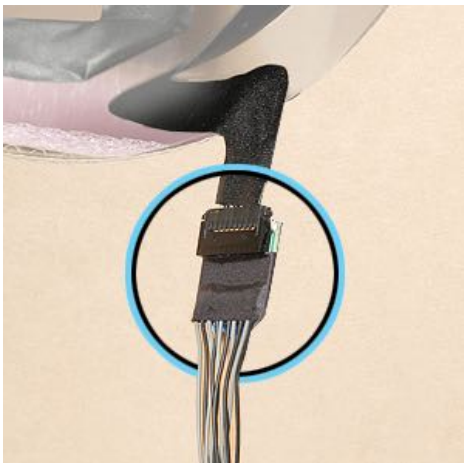
12. Connect backlight extension cable to backlight connector on logic board.



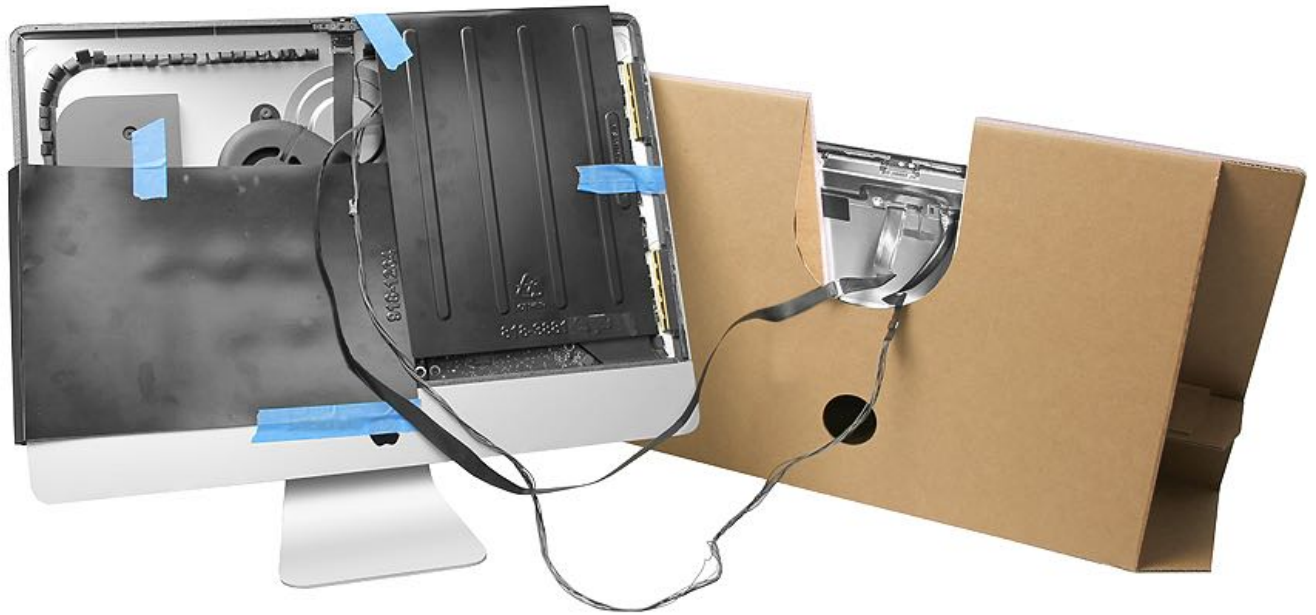
13. Connect other end of backlight extension cable to end of LCD backlight cable (#2).



14. Securely mate backlight extension cable.



15. Locate two power supply covers. Position one horizontally over power supply and one vertically over logic board and cables. Tape power supply covers securely to rear housing. Proper eDP and backlight extension cable set up is shown below.



16. Attach power cord to iMac and start up system to verify system functionality.

Procedure #2: Testing the Panel with the eDP Substitution Cable

This procedure tests a "suspect" eDP cable to determine if the issue is with the eDP cable. Remove the "suspect" eDP cable from the circuit and replace it with the eDP substitution cable.

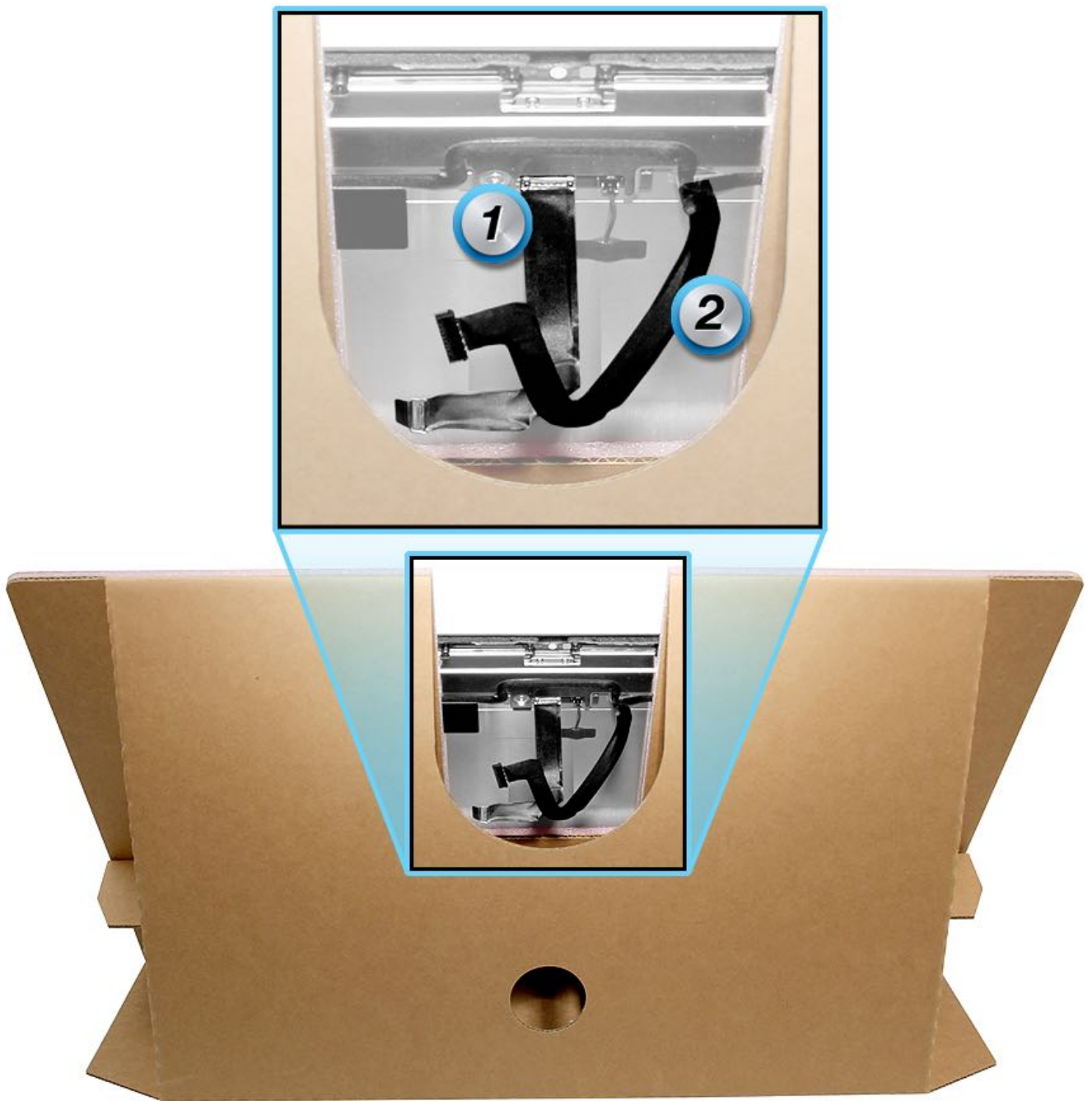
First Steps

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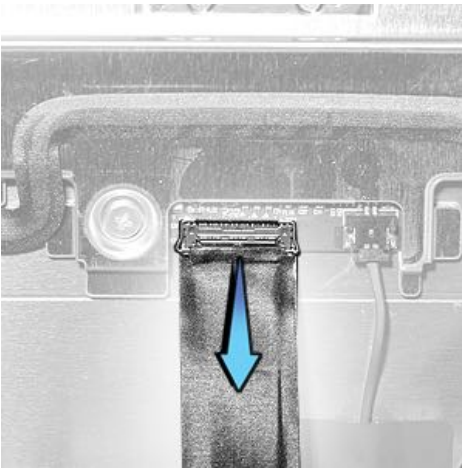
1. Place LCD panel on service support stand.



2.Orient service support stand so embedded DisplayPort cable (#1) and LCD backlight cable (#2) are facing you.



3 Disconnect embedded DisplayPort cable from connector on LCD panel. Use your fingernail to flip locking lever bail. Pull cable out of connector.



4. Locate eDP substitution cable.


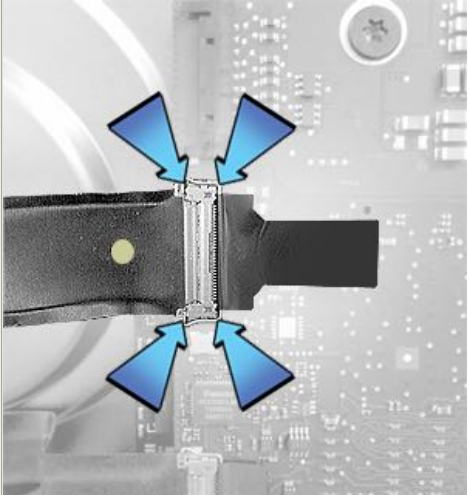


5. **Important:** Each end of the eDP substitution cable has a gold dot to indicate cable orientation. Orient cable **gold dot side up** when connecting eDP substitution cable to logic board and to connector on LCD panel. Connecting cable upside-down (with brass connector facing you) will damage logic board and/or LCD panel. **Note:** With proper care, cables will last approximately **50 insertions**. After 50 insertions, cable degradation may occur and Apple recommends ordering a new Display Extension/Substitution Cable Kit (076-1428).

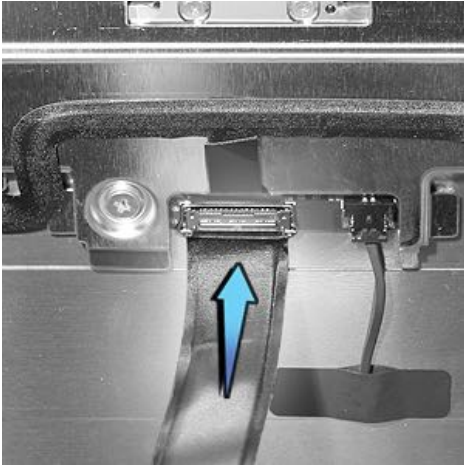
Correct Orientation – Gold Dot Side Up	Incorrect Orientation – Brass Side
 A photograph of an eDP substitution cable. The cable has a black fabric outer jacket. On the top surface, there is a prominent gold-colored circular dot. The cable is held open by a metal locking lever, revealing the gold-plated connector pins.	 A photograph of the same eDP substitution cable, but oriented incorrectly. The bottom surface, which is brass-colored, is facing up. The gold-plated connector pins are visible on the underside.

6. Connect one end of eDP substitution cable to connector on logic board. Cable should be aligned straight on with connector and never inserted at an angle. **Important:** Make sure black tab is attached to locking lever on eDP cable. Attaching locking lever without black tab may cause damage to logic board and/or LCD panel.

- Verify cable has gold dot side up.
- Check that connector is fully seated.
- Flip black tab to right.
- Press locking lever to secure cable to logic board.

Insert eDP Extension Cable into Logic Board Connector	Flip Black Tab and Press Locking Lever To Secure eDP Extension Cable to Logic Board
 A close-up photograph showing the eDP extension cable being inserted into the connector on the logic board. Blue arrows point to the cable's connector pins as they enter the board's socket.	 A close-up photograph showing the eDP extension cable secured to the logic board. Blue arrows point to the black tab and the locking lever, indicating the correct orientation and the action to be taken to secure the cable.

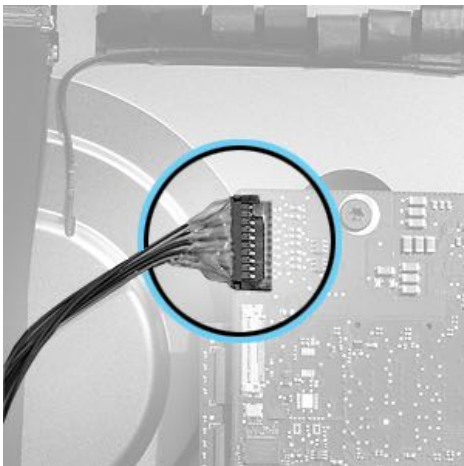
7. Connect other end of eDP substitution cable to eDP connector on back of the LCD panel. Flip black tab up and press locking lever bar to secure cable to connector.



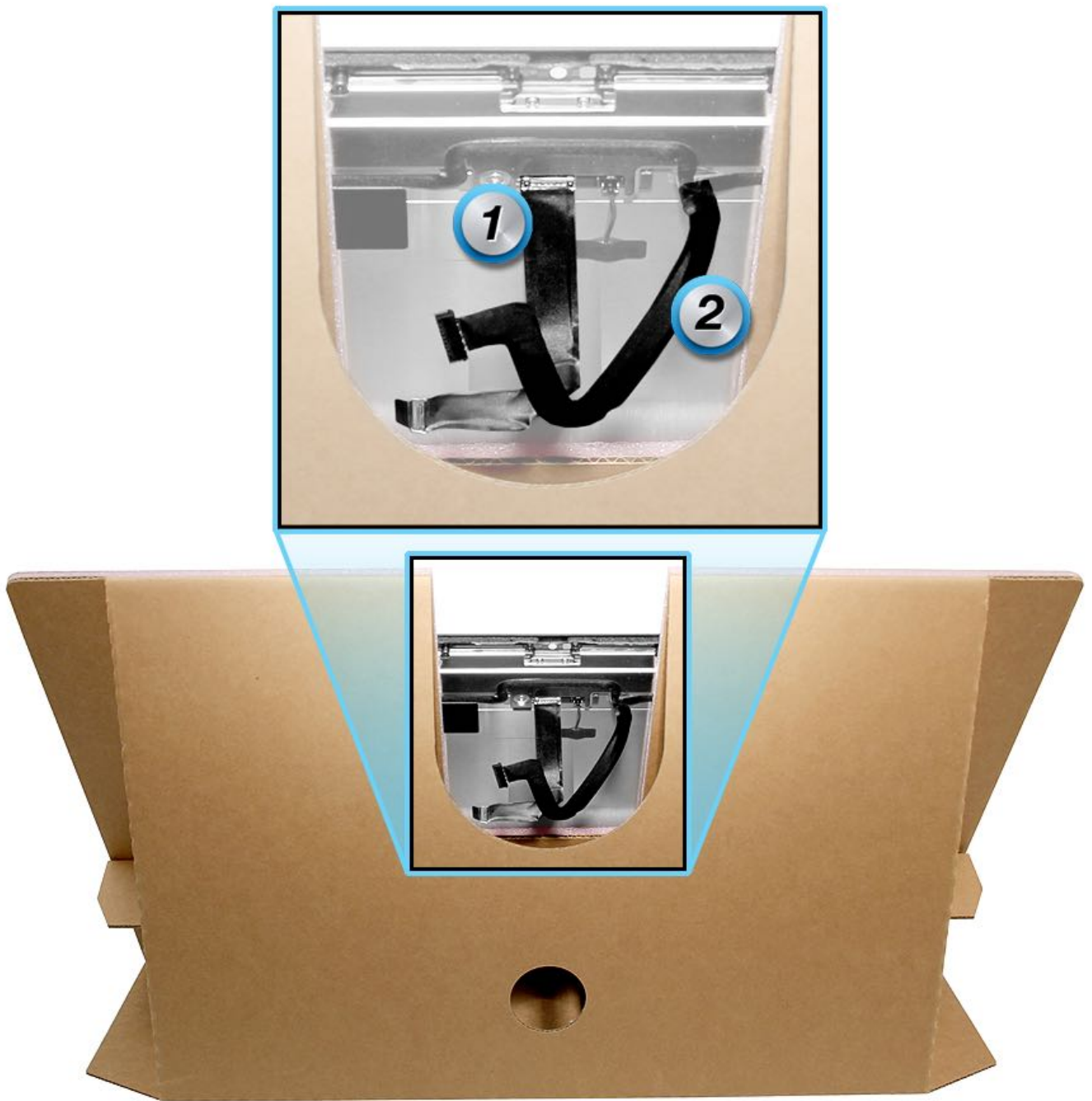
8. Locate backlight extension (BLC) cable.



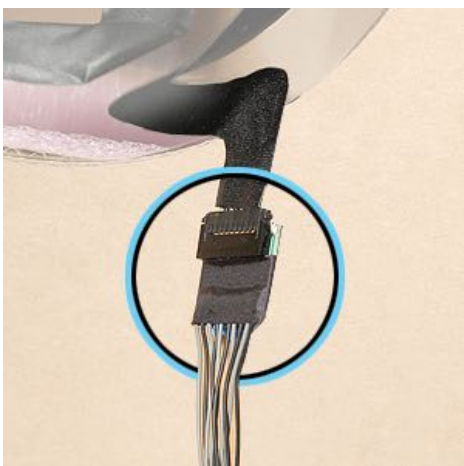
9. Connect backlight extension cable to backlight connector on logic board.



10. Connect other end of backlight extension cable to dangling end of LCD backlight cable (#2).



11. Securely mate backlight extension cable.



12. Locate two power supply covers. Position one horizontally over power supply and one vertically over logic board and cables. Tape power supply covers securely to rear housing. The image below shows proper cable set up for the eDP substitution cable and backlight extension cable.

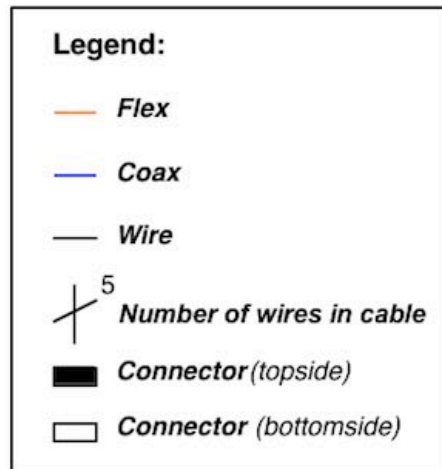


13. Attach power cord to iMac and start up system to verify eDP cable functionality.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Interconnect Diagram

iMac (21.5-inch, Late 2012, Early 2013)

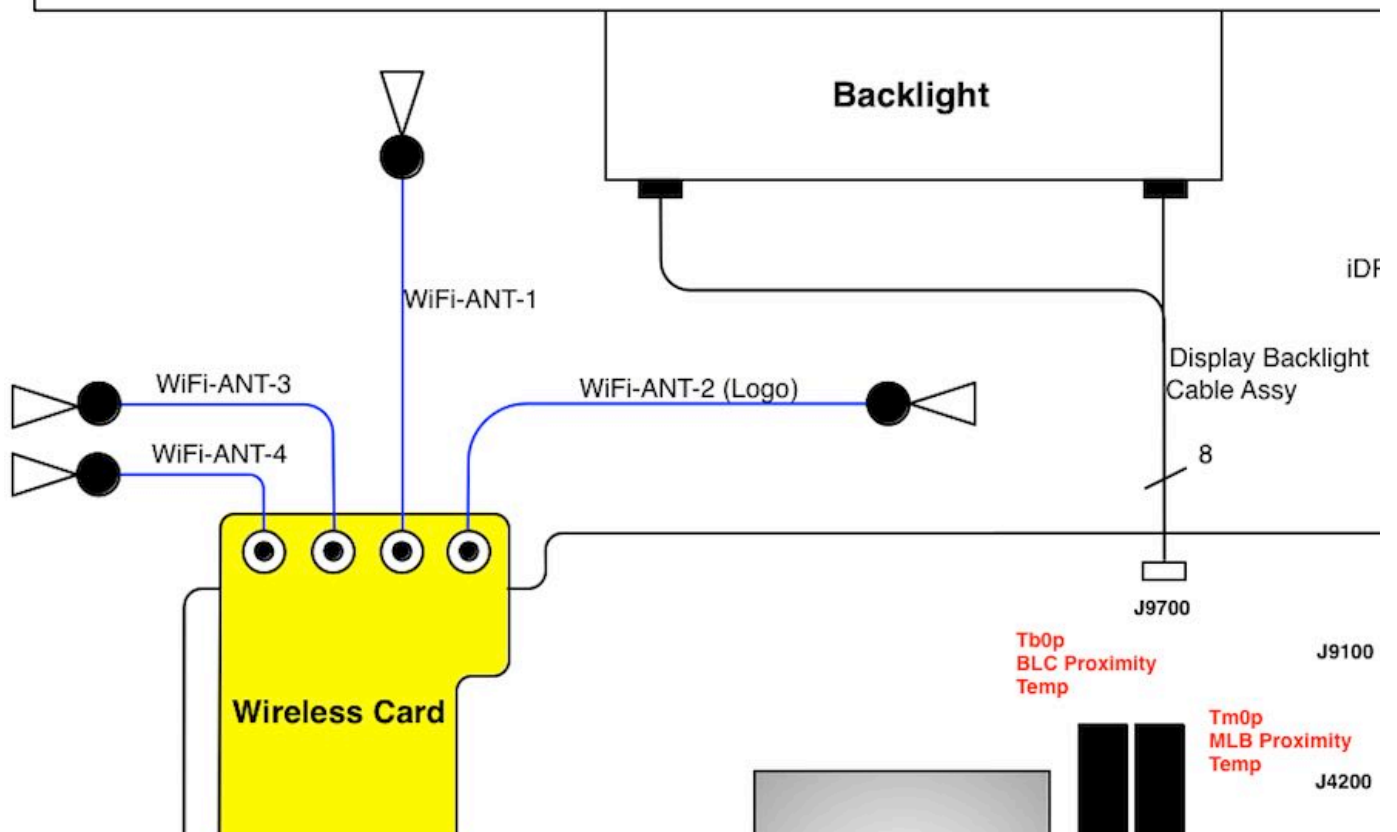
Thermal sensors and cable connector locations are shown below.

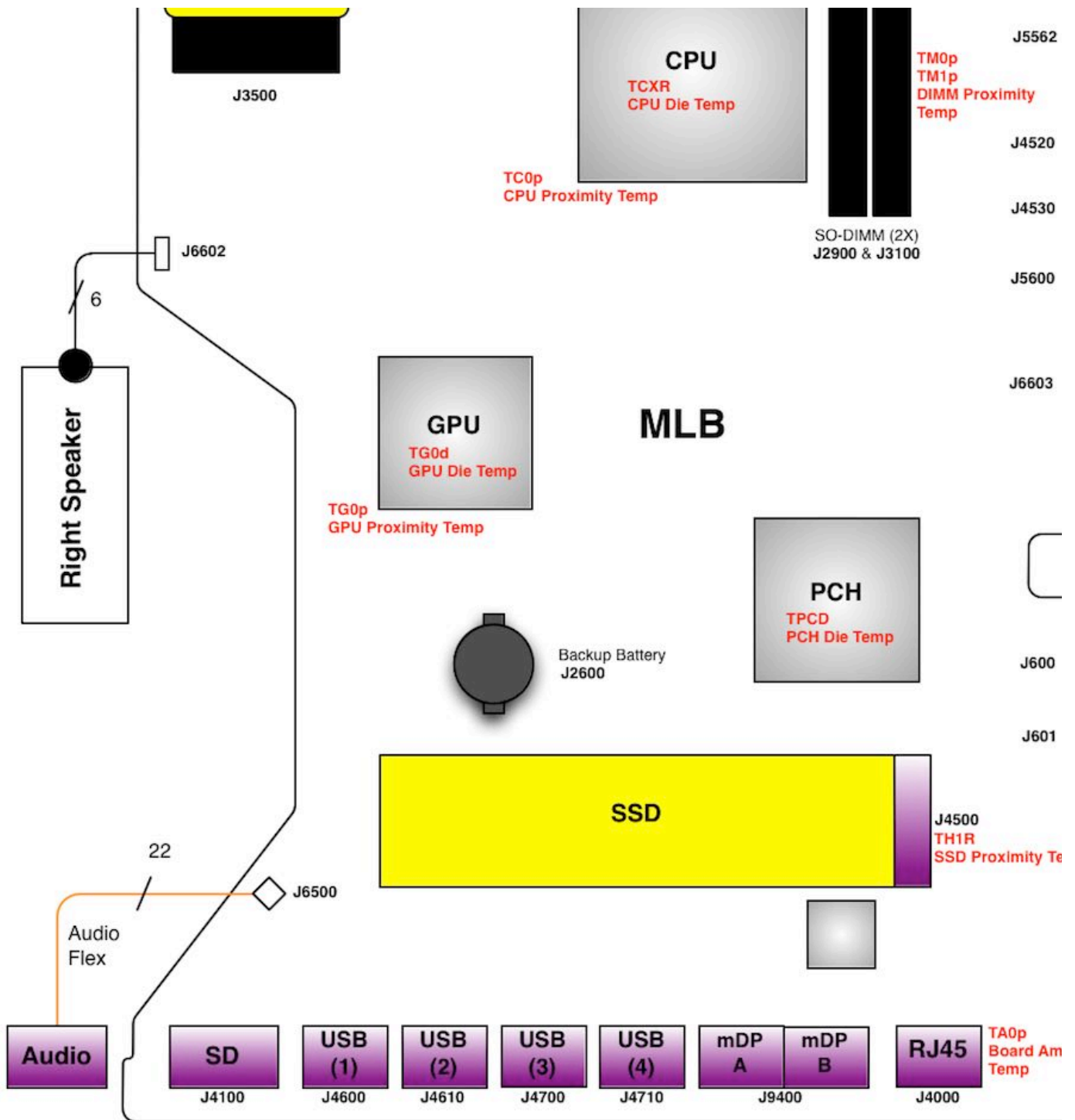


CAM
FLI

DISPLAY

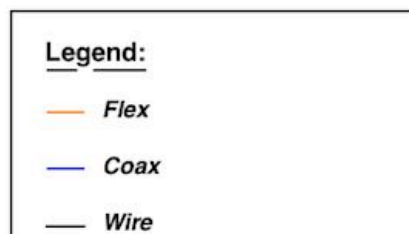
TL1p
LCD TCON Local Temp

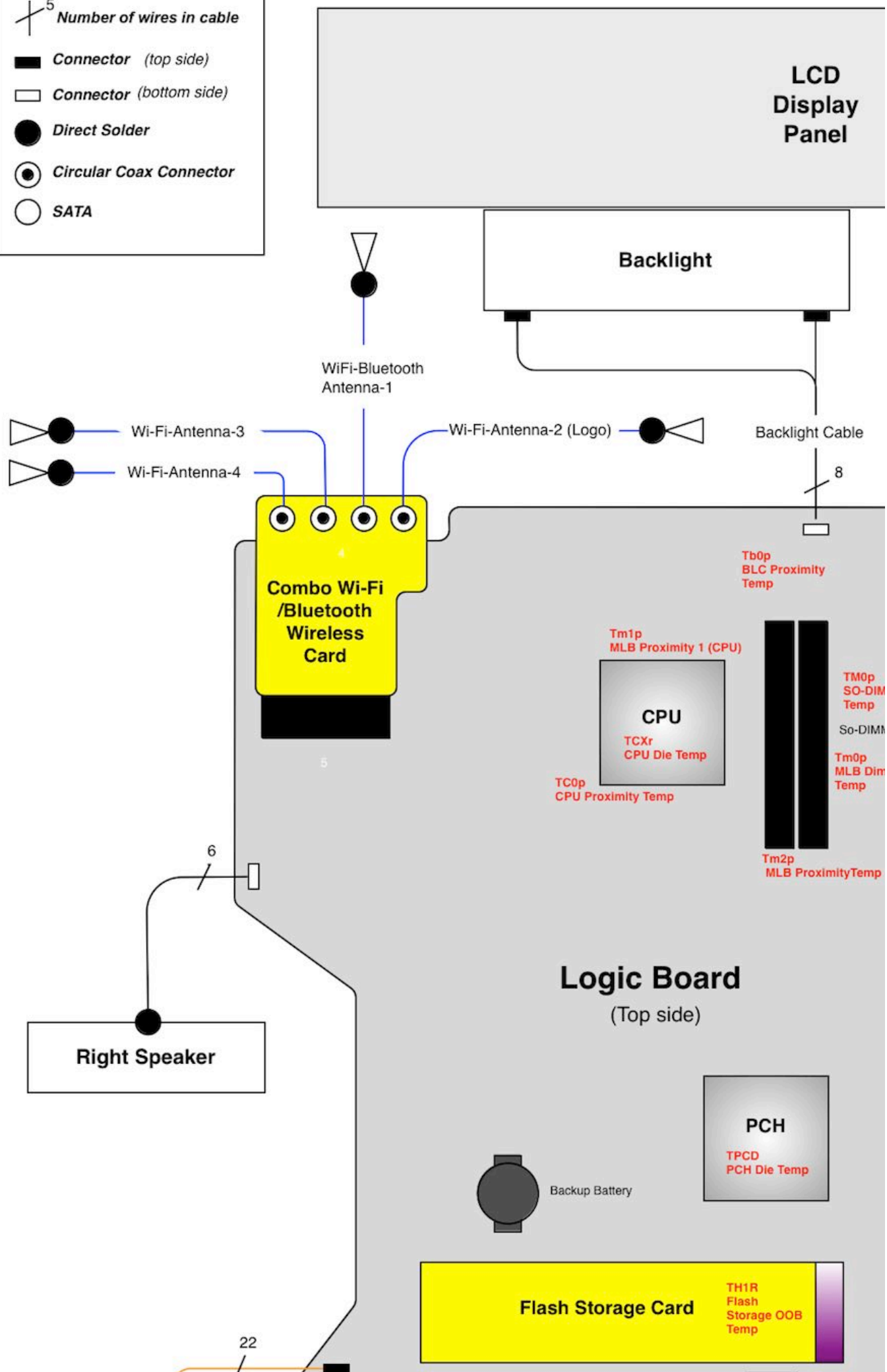
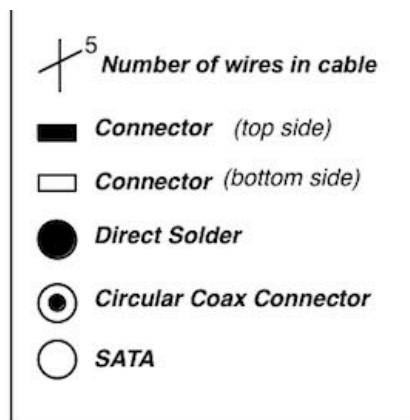




iMac (21.5-inch, Late 2013)

Thermal sensors and cable connector locations are shown below.





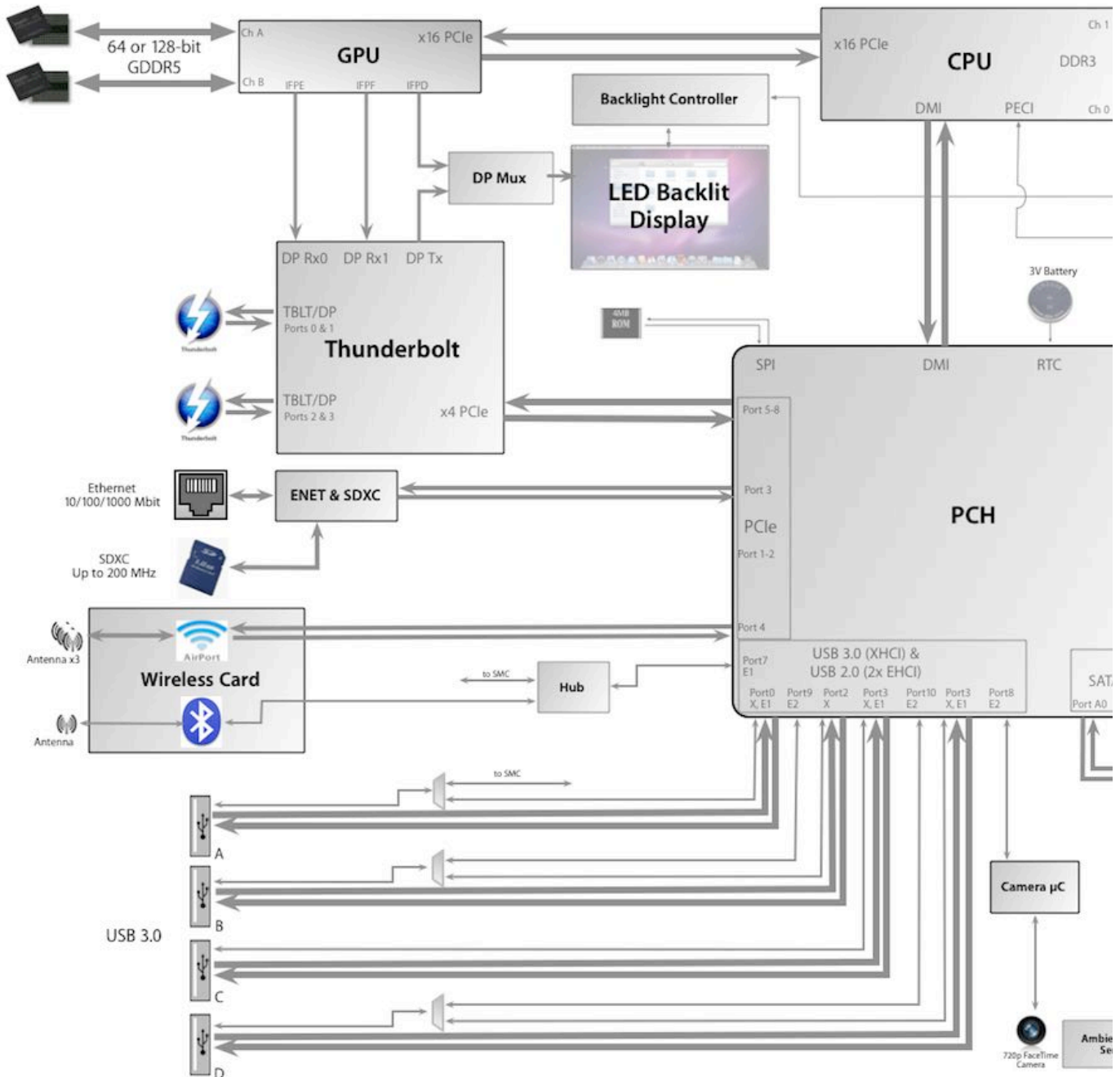


iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Block Diagram

iMac (21.5-inch, Late 2012, Early 2013)

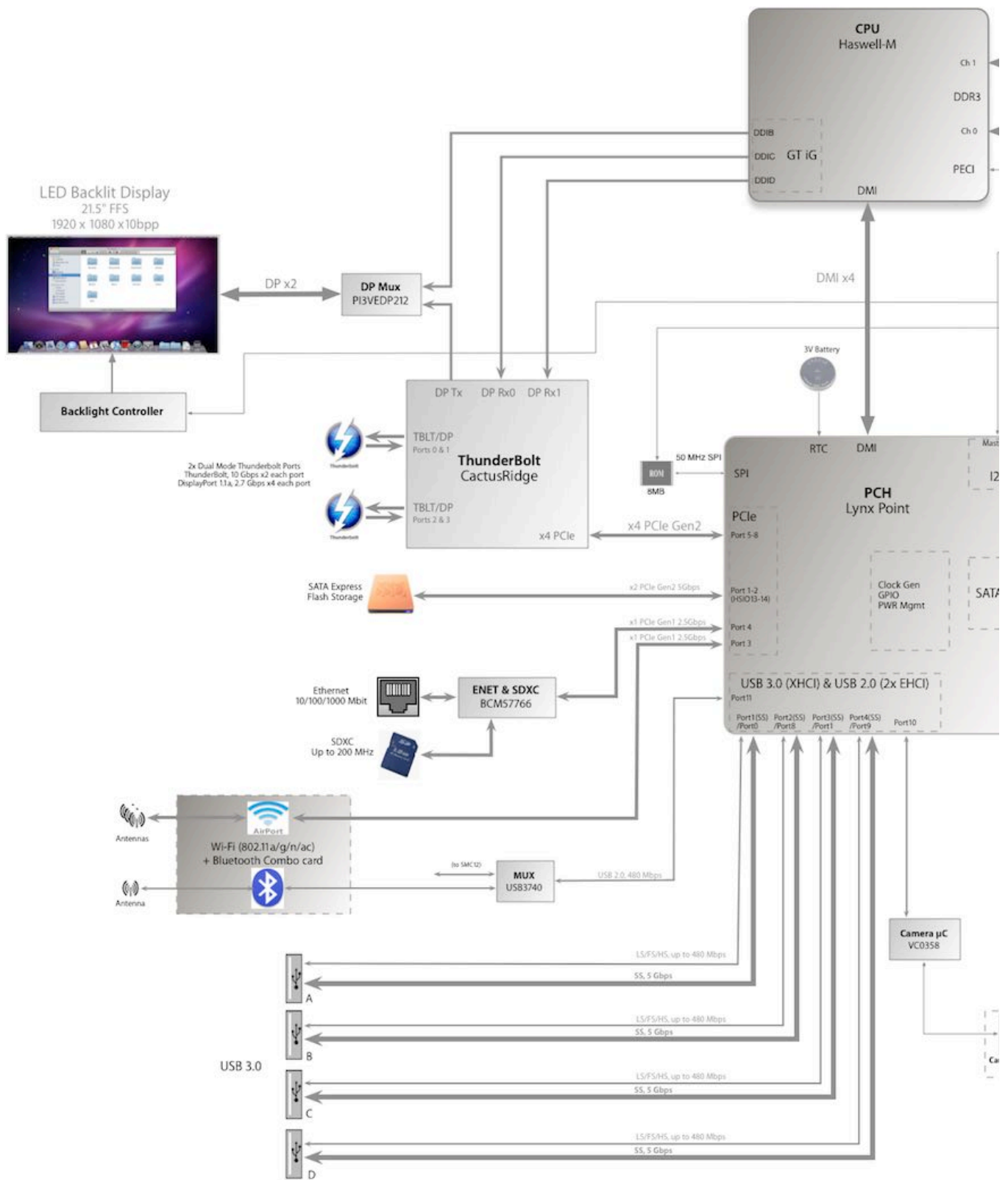
Refer to this diagram to see how modules are interrelated.

Note: iMac (21.5-inch, Early 2013) contains no VRAM or GPU on its logic board.



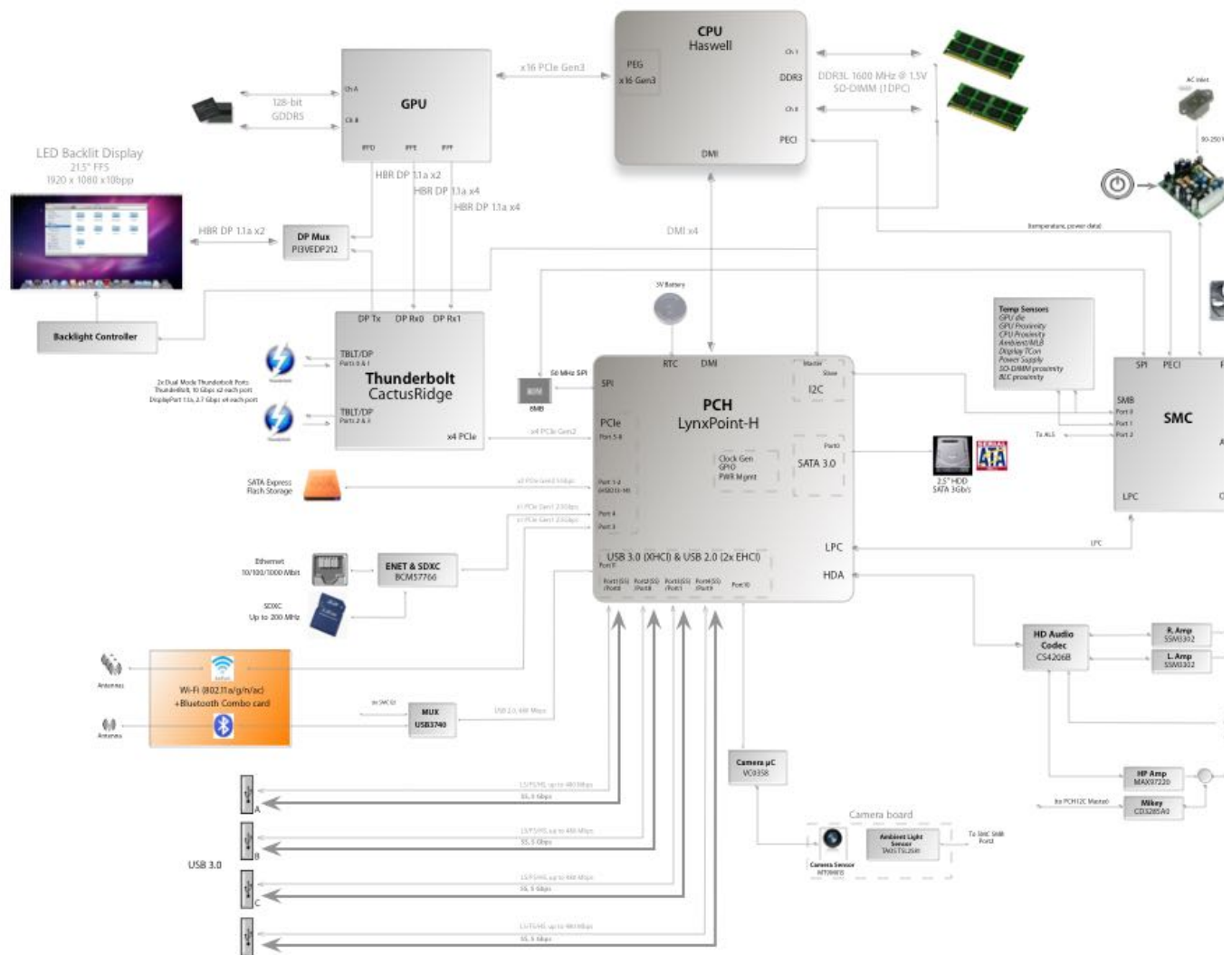
iMac (21.5-inch, Late 2013)

Note: Beginning in 2013, "flash storage" is the approved term for SSD card.



iMac (21.5-inch, Late 2013)

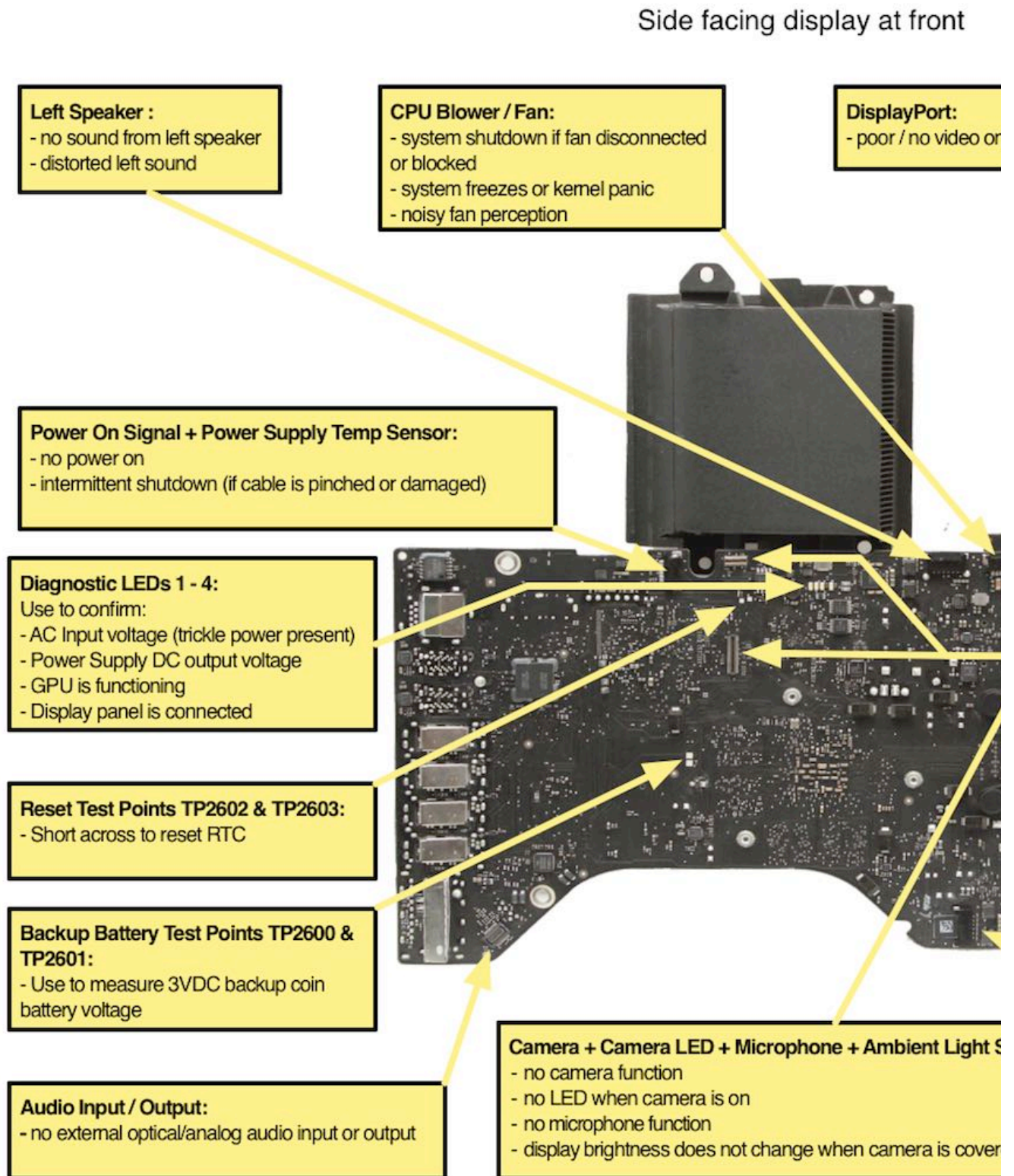
Note: GPU on the logic board.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Functional Overview

Front of iMac (21.5-inch, Late 2012) Logic Board

Refer to this diagram for symptoms related to connectors on the front of the logic board.



Back of iMac (21.5-inch, Late 2012) Logic Board

Refer to this diagram for symptoms related to connectors on the back of the logic board.

Side facing rear enclosure

MEMORY:

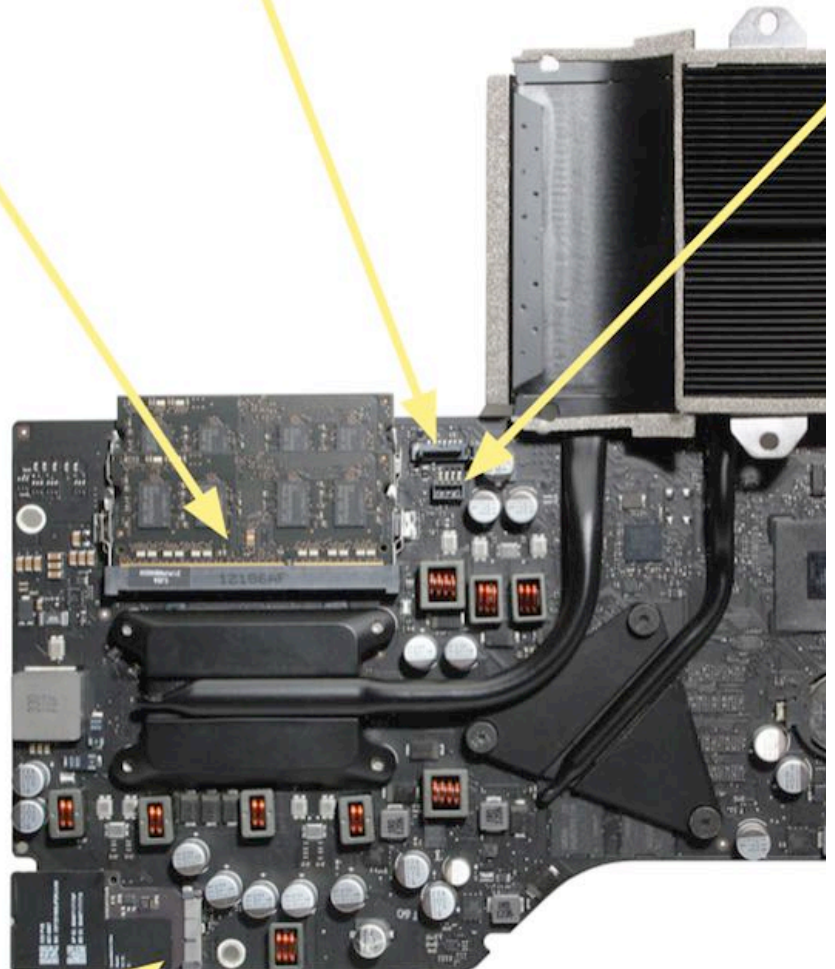
- no boot
- beep tones on startup
- freezes, or kernel panics

SATA Hard Drive Data:

- no hard drive seen on SATA bus
- no boot from hard drive

SATA

- no ha
- no bo



Wireless Card:

- cannot enable Wi-Fi and/or Bluetooth
- Wireless card not seen in System Info

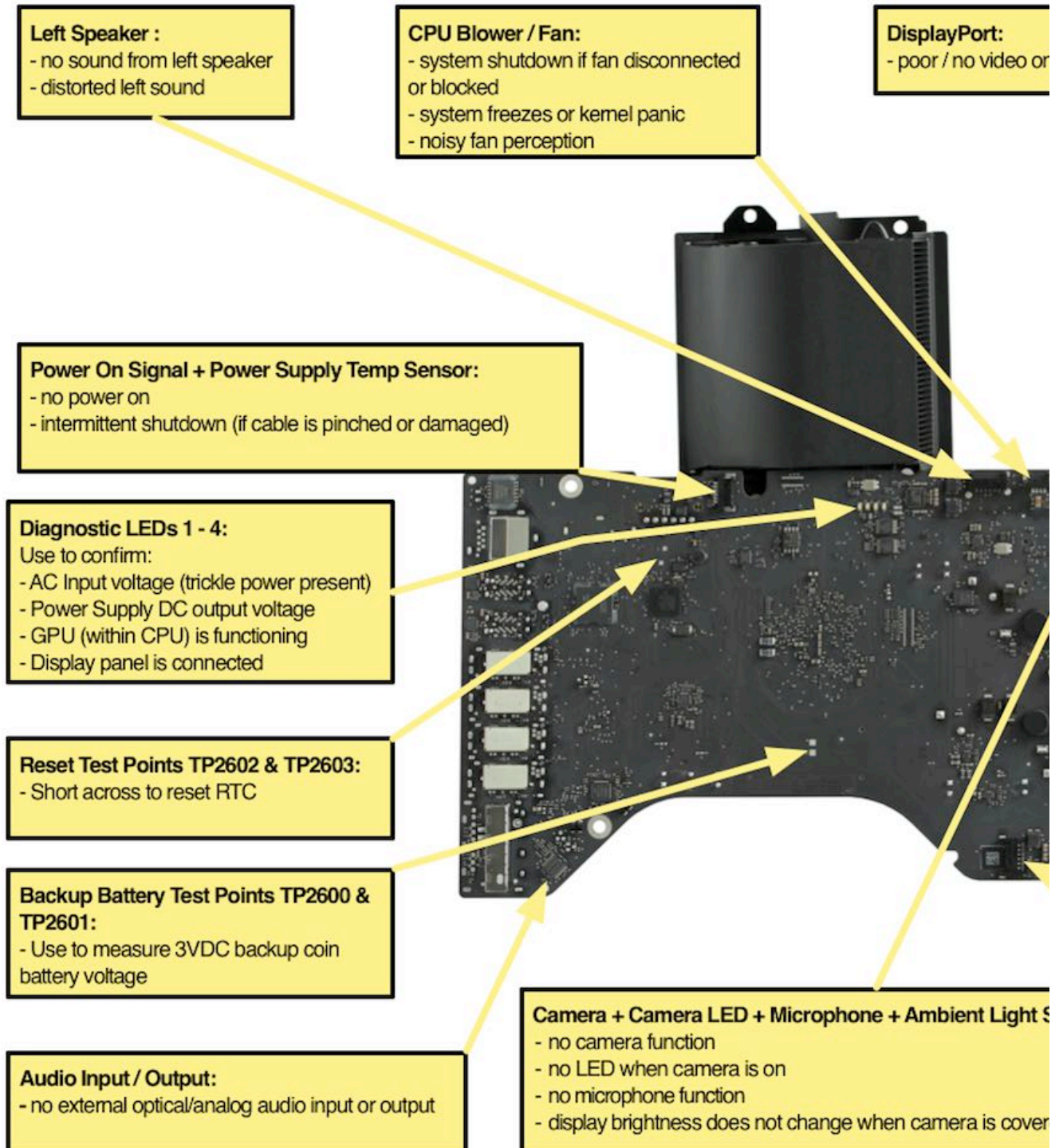
Backup

- no vide
- beep to

Front of iMac (21.5-inch, Early 2013) Logic Board, 3.3GHz, dual-core

Refer to this diagram for symptoms related to connectors on the front of the logic board.

Side facing display at front



Back of iMac (21.5-inch, Early 2013) Logic Board, 3.3GHz, dual-core

Refer to this diagram for symptoms related to connectors on the back of the logic board.

Side facing rear enclosure

MEMORY:

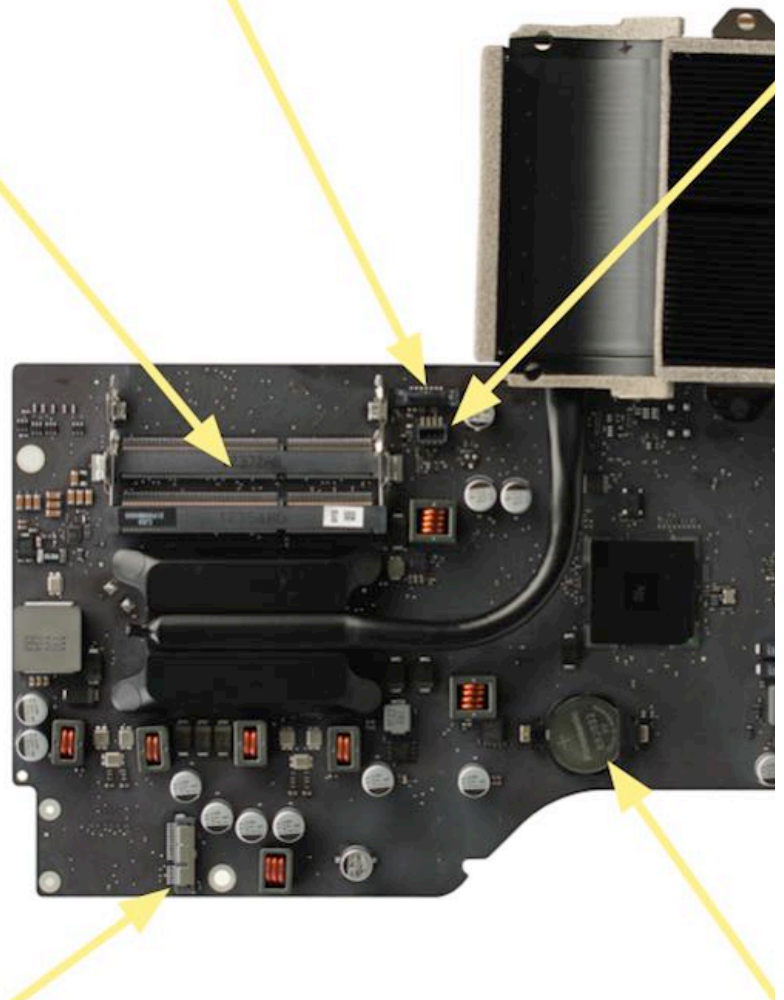
- no boot
- beep tones on startup
- freezes, or kernel panics

SATA Hard Drive Data:

- no hard drive seen on SATA bus
- no boot from hard drive

SATA

- no ha
- no bo



Wireless Card:

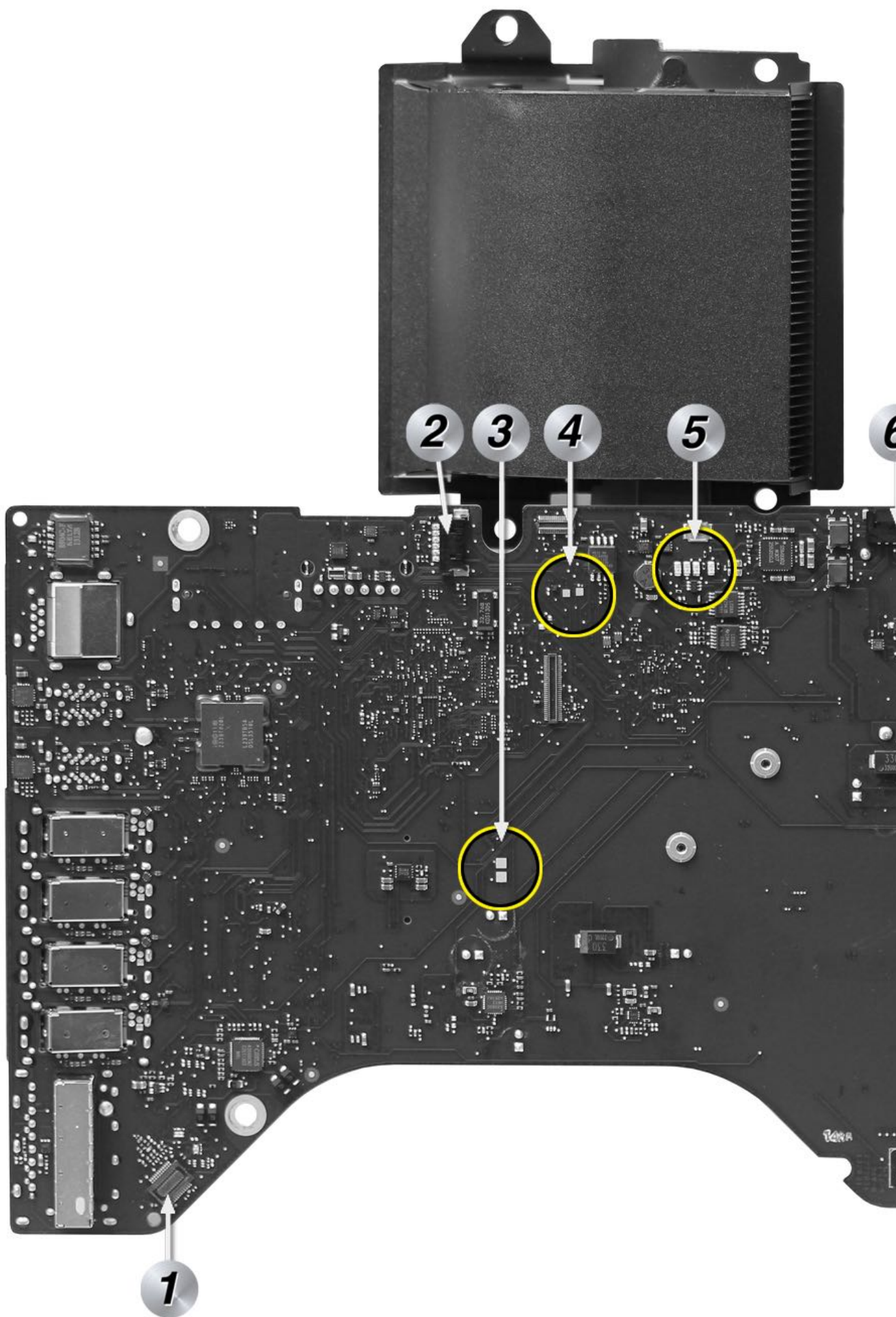
- cannot enable Wi-Fi and/or Bluetooth
- Wireless card not seen in System Info

Backup

- no vide
- beep to

Front of iMac (21.5-inch, Late 2013) Logic Board 661-7923

Refer to this diagram for symptoms related to connectors on the front of the logic board. This is the side facing the back of the display panel.



1 = Audio Input/Output

- no external optical/analog audio input or output

2 = Power On Signal + Power Supply Temp Sensor

- no power on
- intermittent shutdown (if cable is pinched or damaged)

3 = Backup Battery Test Points

- Use to measure 3V DC backup battery coin voltage

4 = Reset Test Points

- Short across to reset Real Time Clock (RTC)

5 = Diagnostic LEDs 1-4

- Use to confirm: AC Input voltage (trickle power present)
- power supply DC output voltage
- display panel is connected

6 = Left Speaker

- no sound from left speaker
- distorted left sound

7 = CPU Blower Fan

- system shutdown if fan disconnected or blocked
- system freezes or kernel panic
- noisy fan perception

8 = Camera + Camera LED + Microphone + Ambient Light Sensor

- no camera function
- no LED when camera is on
- no microphone function

9 = DisplayPort

- poor/no video on internal display

10 = Display Power (Backlight Control)

- no LED backlight on internal display

11 = Wi-Fi Antennas

- poor/no Wi-Fi signal strength

12 = Bluetooth Antenna

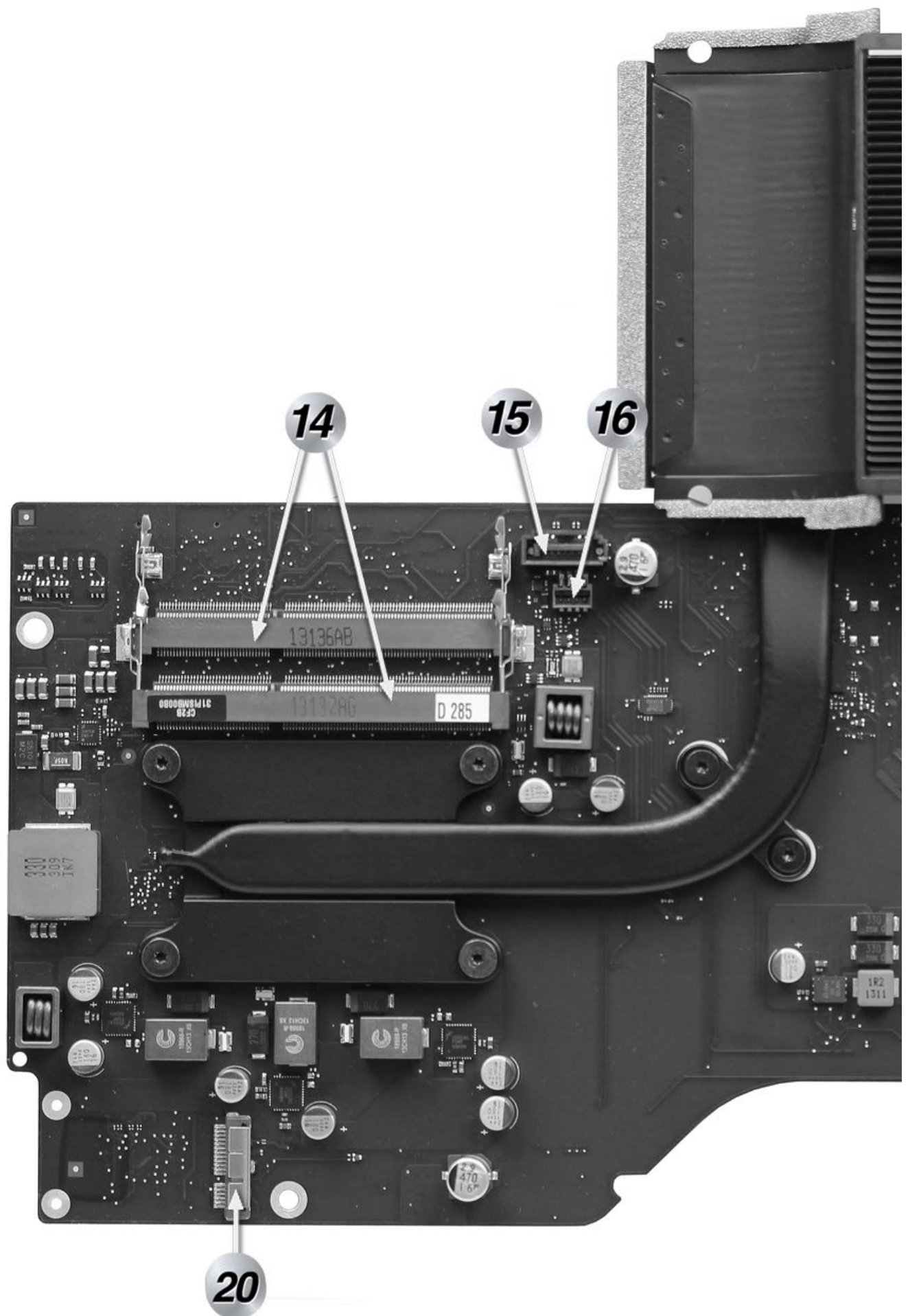
- poor/no Bluetooth signal strength

13 = Right Speaker

- no sound from right speaker
- distorted right sound

Back of iMac (21.5-inch, Late 2013) Logic Board 661-7923

Refer to this diagram for symptoms related to connectors on the back of the logic board. This is the side facing the rear enclosure.



14 = Memory

- no boot
- beep tones on startup
- freezes or kernel panic

15 = SATA Hard Drive Data

- no Sata hard drive seen on Sata bus
- no boot from hard drive

16 = SATA Hard Drive Power

- no SATA hard drive seen on SATA bus
- no boot from hard drive or Fusion drive

17 = DC Power In

- no power

18 = SATA Express Flash Storage Data + Power

- no flash storage seen on SATA Express bus
- no boot from flash storage or Fusion drive

19 = Backup Battery

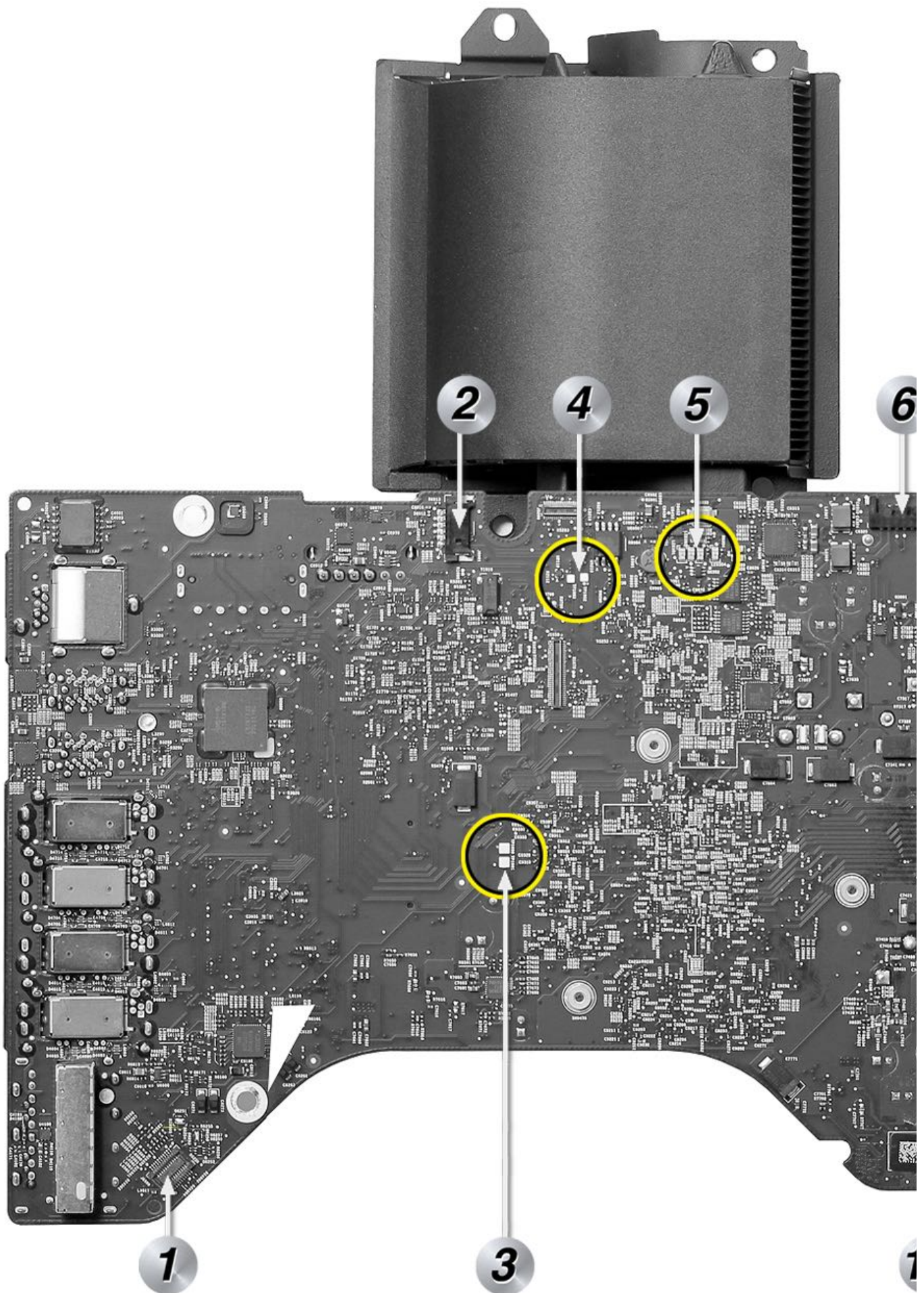
- no video
- beep tones on startup

20 = Wireless Card

- cannot enable Wi-Fi and/or Bluetooth
- Wi-Fi wireless card not seen in System Info > Network > Wi-Fi
- Bluetooth wireless card not seen in System Info > USB

Front of iMac (21.5-inch, Late 2013) Logic Board 661-7503

Refer to this diagram for symptoms related to connectors on the front of the logic board. This is the side facing the back of the display panel.



1 = Audio Input/Output

- no external optical/analog audio input or output

2 = Power On Signal + Power Supply Temp Sensor

- no power on
- intermittent shutdown (if cable is pinched or damaged)

3 = Backup Battery Test Points

- Use to measure 3V DC backup battery coin voltage

4 = Reset Test Points

- Short across to reset Real Time Clock (RTC)

5= Diagnostic LEDs 1-4

- Use to confirm: AC Input voltage (trickle power present)
- power supply DC output voltage
- display panel is connected

6= Left Speaker

- no sound from left speaker
- distorted left sound

7 = CPU Blower Fan

- system shutdown if fan disconnected or blocked
- system freezes or kernel panic
- noisy fan perception

8 = Camera + Camera LED + Microphone + Ambient Light Sensor

- no camera function
- no LED when camera is on
- no microphone function

9 = DisplayPort

- poor/no video on internal display

10 = Display Power (Backlight Control)

- no LED backlight on internal display

11 = Wi-Fi Antennas

- poor/no Wi-Fi signal strength

12 = Bluetooth Antenna

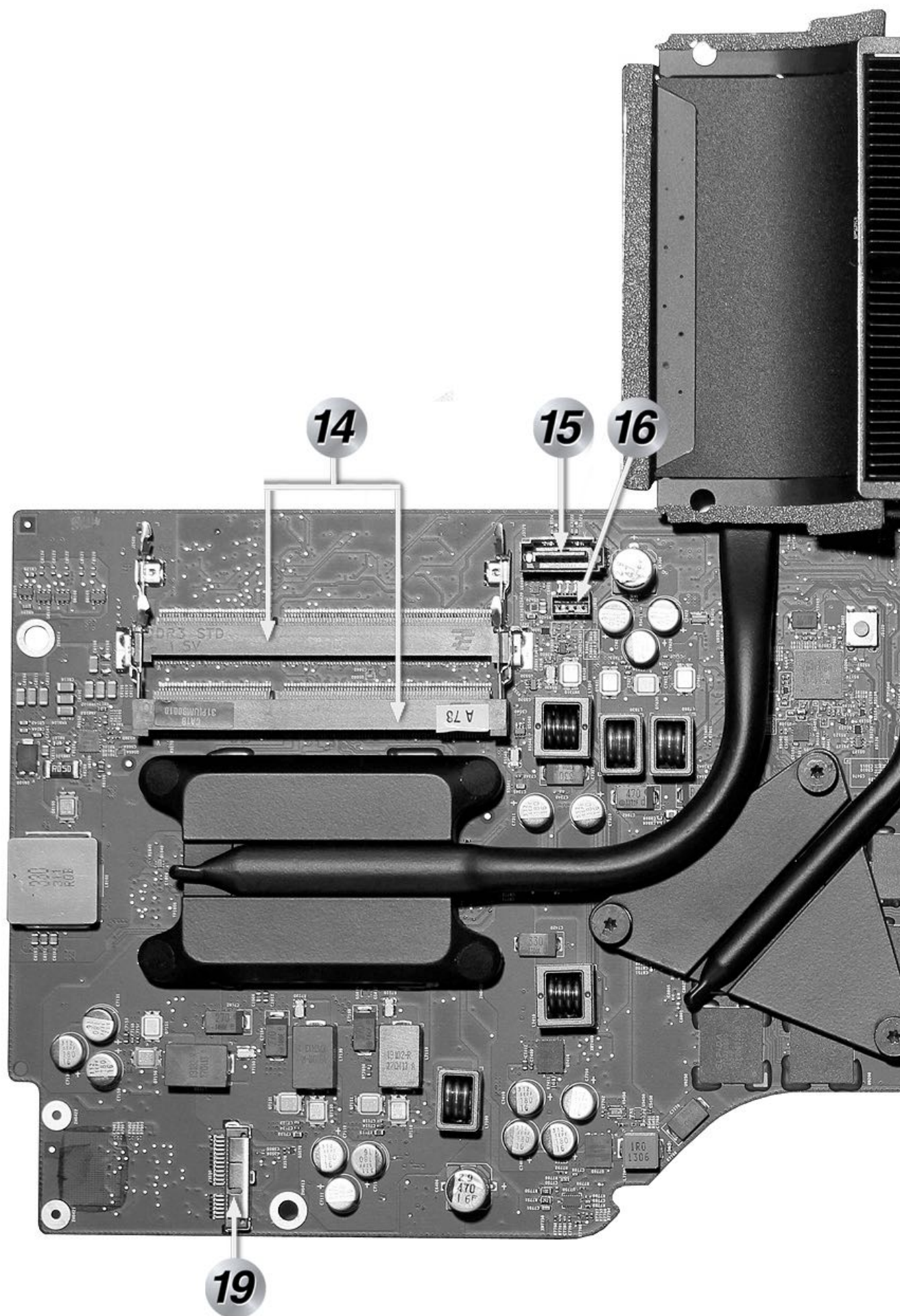
- poor/no Bluetooth signal strength

13 = Right Speaker

- no sound from right speaker
- distorted right sound

Back of iMac (21.5-inch, Late 2013) Logic Board 661-7503

Refer to this diagram for symptoms related to connectors on the back of the logic board. This is the side facing the rear enclosure.



14 = Memory

- no boot
- beep tones on startup
- freezes or kernel panic

15 = SATA Hard Drive Data

- no Sata hard drive seen on Sata bus
- no boot from hard drive

16 = SATA Hard Drive Power

- no SATA hard drive seen on SATA bus
- no boot from hard drive or Fusion drive

17 = DC Power In

- no power

18 = SATA Express Flash Storage Data + Power

- no flash storage seen on SATA Express bus
- no boot from flash storage or Fusion drive

19 = Wireless Card

- cannot enable Wi-Fi and/or Bluetooth
- Wi-Fi wireless card not seen in System Info > Network > Wi-Fi
- Bluetooth wireless card not seen in System Info > USB

20 = Backup Battery

- no video
- beep tones on startup

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Bluetooth Device Connection Issues

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"> Bluetooth can be enabled, but computer won't pair with known-good Bluetooth keyboard, mouse, or trackpad. Paired Bluetooth devices intermittently lose their connections. Bluetooth data transfer times out or is too slow. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"> In System Preferences, make sure Bluetooth is on and set to Discoverable. Attempt to pair the computer with a known-good Bluetooth keyboard, mouse, or trackpad. Reset the Bluetooth device or delete pairing (if applicable). Verify integrity of the user's Bluetooth device with a known-good computer, using Apple Support article TS3048: Troubleshooting wireless mouse and keyboard issues. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Check for and apply latest software and firmware updates. If Bluetooth pairs normally at your service location, research potential sources of interference in the user's environment, such as microwave ovens or cordless phones in the 2.4/5GHz range. See Apple Support article HT1365: AirPort and Bluetooth: Potential sources of interference.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Mac Resource Inspector (MRI) test results or System Information > Hardware > USB Device Tree to verify that wireless card is recognized. Does System Information or MRI detect Bluetooth hardware?	Yes	Go to step 2.		
		No	Go to "Wireless Card Not Recognized" troubleshooting flow.		
2.	Open System Preferences > Bluetooth. Remove all paired devices. Pair computer with a known-good Bluetooth device. Run latest version of Bluetooth Service Diagnostic (BSD) while actively paired with known-good device. Does computer pass BSD tests?	Yes	Computer appears to be performing to specification when paired with a known-good Bluetooth device. The user's Bluetooth device may be the issue. Go to "I/O Devices: Troubleshooting External Bluetooth Peripherals" troubleshooting flow.		
		No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Start up from known-good, up-to-date, bootable OS X volume. Try to connect to a known-good Bluetooth device. Compare Bluetooth performance and reliability to a known-good computer of similar type and Bluetooth specification.	Yes	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers , and restore the computer to the correct build of OS X. Verify resolution.		
	Is Bluetooth performance comparable between user's computer and known-good computer?	No	Go to step 4.		
4.	Remove LCD panel with glass. Locate the A3 Bluetooth antenna (second from left), and inspect antenna's cable and connector for any damage.	Yes	Go to step 5.		
	Are antenna cable and connector in good condition?	No	Replace Bluetooth antenna. Verify issue resolved.	X03	OTHER ELECTRIC
5.	Locate A3 Bluetooth antenna port on wireless card (second from left), and verify it is not damaged, loosened, or unsoldered. Reseat antenna connector to wireless card. Make sure connection is secure and correctly aligned.	Yes	Go to step 6.		
	Is A3 antenna connector port in good condition and securely seated?	No	Replace wireless card. Verify issue resolved.	N17	WIRELESS DEVICE
6.	Reseat A3 antenna cable connection to wireless card (second from left). Connect an external display and try to pair with a known-good Bluetooth device.	Yes	Issue resolved by reseating Bluetooth antenna. Verify resolution.		
	Did computer pair successfully with known-good Bluetooth device?	No	Go to step 7.		
7.	The Bluetooth antenna is located on upper edge of the enclosure and is available as a standalone part.	Yes	Go to step 8.		
	Do you have immediate access to a known-good Bluetooth antenna?	No	Replace Bluetooth antenna. Verify issue resolved.	X03	OTHER ELECTRIC
8.	Substitute known-good (upper) Bluetooth antenna. Connect an external display and try to pair with a known-good Bluetooth device.	Yes	Replace Bluetooth antenna. Verify issue resolved.	X03	OTHER ELECTRIC
	Did computer pair successfully with known-good Bluetooth device?	No	Replace user's wireless card. Reinstall user's Bluetooth antenna. Verify issue resolved.	N15	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
9.	<ul style="list-style-type: none"> Run latest version of Bluetooth Service Diagnostic to verify Bluetooth functionality. Pair with a known-good Bluetooth device and verify that connection is sustained for several minutes. <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Ethernet Issues

Unlikely causes:

AirPort/Bluetooth antenna(s), battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, wireless card.


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">No Ethernet device present.Unable to access Ethernet network resources.Ethernet device shows no connection.Ethernet device unable to get an IP address.Slow Ethernet network performance. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Verify network setup by accessing it directly via a known-good computer's Ethernet port.Launch System Information. Verify that computer's Ethernet port appears in the Network devices tree.Test with known-good network hardware and an Ethernet cable (Cat-5 or better is recommended for 100+ Mbps connections).Using known-good network hardware and cable, start up from a known-good, up-to-date OS X volume. Go to Network Utility > Info and verify that Link Status is "Active."Check network settings. If a known-good DHCP server is available, set System Preferences > Network > Ethernet to Using DHCP. Verify IP address. (If it begins with 169.x.x.x, system was unable to get a valid IP address.) See Apple Support article TA21114: Mac OS X: How To Force a DHCP Lease Renewal.When started up from user's OS, revert to default network settings by creating a new location in System Preferences > Network.Check for and apply latest software and firmware updates.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect Ethernet port for dust, debris, damage, or bent pins. Use compressed air to remove debris. Plug in a known-good Ethernet cable and make sure all pins make physical contact with connector. Are any Ethernet port pins damaged or making insufficient contact with known-good RJ-45 connector?	Yes	Go to step 2.		
		No	Go to step 4.		
2.	Inspect logic board, Ethernet port, and enclosure for dents, scratches, or other indications of impact or abuse. Does accidental damage appear to be cause of issue?	Yes	Go to step 3.		
		No	Replace logic board. Verify issue resolved.	M10	MLB
3.	Inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options. Does user want to proceed with out-of-warranty repair?	Yes	Replace logic board. Verify issue resolved.	M10	MLB
		No	Issue resolved. Return computer to user using correct positioning.		

	Check	Result	Action	Code	Commodity
4.	Ensure that user's computer is connected to the Internet using a known-good Ethernet cable, and that WiFi is turned off so that all network traffic goes through built-in Ethernet.	Yes	Reinstall correct build of OS X on user's computer. Issue resolved by reinstalling correct build of OS X on user's computer.		
	Start up computer using OS X Recovery or an up-to-date, bootable OS X volume. Hold down Command-R during startup to restart from recovery partition. See Apple Support articles HT4718: OS X: About OS X Recovery and HT1159: Mac OS X versions (builds) for computers .	No	Go to step 5.		
	Open Safari browser and attempt to access a known-good external web page such as http://www.apple.com to verify Ethernet connectivity. Look for the web page to load, or for a timeout indicating page did not load.				
5.	Are Ethernet network resources accessible starting from recovery partition or a known-good OS?				
	Restart user's computer to OS on its built-in OS X boot volume.	Yes	Go to step 6.		
	In System Preferences > Network > Ethernet, verify that link status is Connected (green dot) and that a valid IP address is listed. Connect computer to an Ethernet network with a known-good DHCP server. Make sure static DHCP maps or filtering are not preventing address allocation. Note: DHCP allocation may not be instantaneous, depending on network. Retest. Is Ethernet link status active?	No	Replace logic board. Verify issue resolved.	M10	MLB
6.	Go to System Preferences > Network > Ethernet and obtain router IP address. Use Network Utility to ping router IP address. Use a simple hub/switch environment.	Yes	No performance or connectivity issues detected. No repair necessary. The problem may be the network environment. Refer user to Apple Support article TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection .		
	Is Network Utility able to ping router IP address?	No	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	Perform network testing from previous step, using same cable and network, but with a known-good computer. Is network performance of user's computer inferior to known-good computer?	Yes	Replace logic board. Verify issue resolved.	M10	MLB
		No	No performance or connectivity issues detected. No repair necessary. The problem may be the network environment. Refer user to Apple Support article TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection.		
8.	<ol style="list-style-type: none"> 1. Connect Ethernet cable to a known-good network with a DHCP server. 2. In System Preferences > Network > Ethernet, verify link status is Connected (green dot). 3. Configure TCP/IP settings to Using DHCP and check that a valid IP address is obtained from server (not a self-assigned one starting with 169.x.x.x). 4. Launch web browser and verify that you can access websites and download files. Is issue resolved?	Yes	Issue resolved.		
		No	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

Thunderbolt Ethernet Adapter Connectivity Issues

Unlikely causes:


N/A


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">No Ethernet present in Network preferences.Unable to access Ethernet network resources.Ethernet shows no active link or connection.Ethernet intermittently drops connection.Ethernet unable to get an IP address.Slow Ethernet network performance. <p>NOTE: These symptoms address issues with the Thunderbolt Ethernet Adapter, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on the 'Troubleshoot another issue' button to select a functional area and issue that addresses issues with computer's Thunderbolt port instead.</p> <p>NOTE: Inform user that computer failures due to accidental damage are not covered, and if applicable, discuss out-of-warranty repair options. Refer to Apple Support article OP14: SERVICE: Determining and Quoting Accidental Damage.</p>	<ol style="list-style-type: none">Verify network setup by accessing it directly via an Ethernet port on a known-good computer.Check System Information. Verify Ethernet port presence in System Information > Hardware > Ethernet Cards. Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt.Try known-good Ethernet adapter, network hardware and Ethernet cable and user's computer. <p>Note: Cat 5 or better is recommended for 100+ Mbps connections.</p> <ol style="list-style-type: none">Using a known-good Ethernet adapter, network hardware and cable, start up from a known-good OS X volume or Lion Recovery Partition. Go to Network Utility > Info and verify Link Status is "Active."Check network settings. If a known-good DHCP server is available, set System Preferences > Network > Ethernet to "Using DHCP." Verify IP address. <p>Note: If the IP address begins with 169.x.x.x, the system was unable to get a valid IP address. See one of the following Apple Support articles:</p> <ul style="list-style-type: none">PH3856: OS X Lion: Renew an IP address from the DHCP server.PH6592: Mac OS X 10.6: Renewing an IP address from the DHCP server. <ol style="list-style-type: none">Start up from user's OS. Revert to default network settings by creating a new location in System Preferences > Network.Check for and apply the latest software and firmware updates.



Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect both connectors, cable, and body of Thunderbolt Ethernet Adapter. Check for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.	Yes	Go to step 2.		
		No	Go to step 3.		
	Did you find any damaged components?				

	Check	Result	Action	Code	Commodity
2.	Using Apple Support article OP14: SERVICE: Determining and Quoting Accidental Damage as a guide, inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X26	EXTERNAL CABLE
	If applicable, discuss out-of-warranty repair options. Refer to Apple Support article OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Portables and Displays for pricing. Does user want to proceed with out-of-warranty repair?	No	Issue resolved. Return computer to user using correct positioning.		
3.	Connect user's Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer. Start up computer completely and launch System Information.	Yes	Go to step 6.		
	Verify Ethernet port presence in System Information > Hardware > Ethernet Cards. Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt. Does user's Thunderbolt Ethernet Adapter appear in both areas of System Information?	No	Go to step 4.		
4.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 5.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
5.	Connect a known-good Thunderbolt Ethernet Adapter to user's computer to verify adapter presence.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
	Verify Ethernet port presence in System Information > Hardware > Ethernet Cards. Verify Ethernet adapter presence in System Information > Hardware > Thunderbolt. Does known-good Thunderbolt Ethernet Adapter now appear in both areas of System Information?	No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.</p>	X99	

	Check	Result	Action	Code	Commodity
6.	Connect user's Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer.	Yes	Go to step 9.		
	<p>Connect adapter's RJ-45 port to an Ethernet network with a known-good DHCP server using a known-good Cat 5 or better Ethernet cable. Start up computer completely.</p> <p>In System Preferences > Network > Ethernet, verify link status is "Connected" (green dot) and a valid IP address is listed. Make sure static DHCP maps or filtering are not preventing address allocation.</p> <p>Note: DHCP allocation may not be instantaneous, depending on the network. Retest.</p> <p>Is Ethernet link status active?</p>	No	Go to step 7.		
7.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 8.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
8.	Connect known-good Thunderbolt Ethernet Adapter to an available Thunderbolt port on user's computer. Connect adapter to known-good DHCP server using a Cat 5 or better Ethernet cable.	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
	<p>Start up computer. In System Preferences > Network > Ethernet, verify link status is "Connected" (green dot) and a valid IP address is listed.</p> <p>Is Ethernet link status now active?</p>	No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.</p>	X99	
9.	Check network connection on user's computer with known-good cable and network, and user's Thunderbolt Ethernet Adapter.	Yes	Go to step 12.		
	<p>Go to System Preferences > Network > Ethernet and obtain Router IP address.</p> <p>Use Network Utility to ping Router IP address. Use a simple hub/switch environment.</p> <p>Is Network Utility able to ping Router IP address?</p>	No	Go to step 10.		

	Check	Result	Action	Code	Commodity
10.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 11.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
11.	<p>Check network connection on user's computer with known-good Thunderbolt Ethernet Adapter, cable and network.</p> <p>Go to System Preferences > Network > Ethernet and obtain Router IP address. Use Network Utility to ping Router IP address. Use a simple hub/switch environment.</p> <p>Is Network Utility now able to ping Router IP address?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.</p>	X99	
12.	<p>Continue to use Network Utility to ping Router IP address. Use a simple hub/switch environment. Verify connection does not randomly disconnect (seen as packet loss during pings).</p> <p>In System Preferences > Network > Ethernet, verify link status is consistently active throughout testing.</p> <p>Is Network Utility able to ping Router IP address consistently, with no packet loss?</p>	Yes	Go to step 15.		
		No	Go to step 13.		
13.	To troubleshoot this issue completely, a known-good Thunderbolt Ethernet Adapter is required.	Yes	Go to step 14.		
	Do you have immediate access to a known-good Thunderbolt Ethernet Adapter?	No	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
14.	<p>Check network performance on user's computer with known-good Thunderbolt Ethernet Adapter, cable and network.</p> <p>Continue to use Network Utility to ping Router IP address. Verify connection does not randomly disconnect (seen as packet loss during pings).</p> <p>In System Preferences > Network > Ethernet, verify link status is consistently active throughout testing.</p> <p>Is Network Utility able to ping Router IP address consistently, with no packet loss?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.</p>	X03	
15.	<p>Connect user's Ethernet Adapter and cable to a known-good computer on same network. Continue to use Network Utility to ping Router IP address.</p> <p>In System Preferences > Network > Ethernet, verify link status is consistently active throughout testing.</p> <p>Is network performance of user's adapter inferior when used with a known-good computer?</p>	Yes	Replace Thunderbolt Ethernet Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	<p>No performance or connectivity issues detected. No repair necessary. The problem may be network environment.</p> <p>Refer user to Apple Support article TS1317: Mac OS X: Troubleshooting a cable modem, DSL, or LAN Internet connection.</p>		
16.	<ol style="list-style-type: none"> 1. Connect Ethernet cable to a known-good network with a DHCP server. 2. In System Preferences > Network > Ethernet, verify the link status is "Connected" (green dot). 3. Configure TCP/IP settings to "Using DHCP" and check that a valid IP address is obtained from server (not a self-assigned one starting with 169.x.x.x). 4. Launch web browser and verify access to websites and download files. <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Wi-Fi Connection Issues

Unlikely causes:


Battery, camera, camera/microphone/ALS cable, DisplayPort cable, fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, power supply, right speaker, stand

Quick Check




Symptoms	Quick Check
<p>Wi-Fi interface is present and can be enabled but the following symptoms occur during use:</p> <ul style="list-style-type: none"> • Unable to find or connect to wireless networks • Slow or stalled data transfers • Intermittent connection dropouts <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>On user's computer:</p> <ol style="list-style-type: none"> 1. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. 2. Using alternate Ethernet network interface, connect to Internet, then check for and apply latest software and firmware updates. 3. If computer is running OS X Lion, refer to the steps in Apple support article TS3925: OS X Lion: Unable to download OS X Lion wirelessly from Mac App Store - "Your device or computer could not be verified" to delete the file "networkinterfaces.plist" from the SystemConfiguration folder. Restart the user's computer into the user's OS and create a new network location in System Preferences. Attempt to connect to the Internet again via Wi-Fi to verify if this resolves the issue. 4. Start up computer using recovery partition or an up-to-date, bootable OS X volume, and attempt to connect to a wireless network. 5. In System Preferences > Sharing select Internet Sharing. Configure a known-good computer to "Share your connection from" > Ethernet and "To computers using" > Wi-Fi. Try to connect user's computer to the newly created wireless network. 6. Using a known-good OS & base station, compare Wi-Fi throughput in Activity Monitor > Network to that of a similar computer. 7. Refer to Apple Support article HT5606: About Wireless Diagnostics to familiarize yourself with OS X 10.8.4 wireless diagnostic utilities. 8. Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. 9. Reset the SMC using the procedure for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC). <p>If the issue cannot be reproduced onsite, prompt the user to check their AirPort base station for the following:</p> <ol style="list-style-type: none"> 1. Check for base station firmware updates. 2. Check for nearby interference sources in the 2.4/5GHz range such as microwave ovens and cordless phones. See Apple Support article HT1365: AirPort and Bluetooth: Potential sources of wireless interference. 3. Make sure base station is not using MAC address filtering or has not created a hidden network. 4. Make sure base station is not set to low-power transmission mode. 5. Make sure base station is not using an unsupported connection and encryption protocol. 6. Check for Wi-Fi channel overlap (a nearby base station using an adjacent channel). 7. Connect to a known-good test network. 8. Test in a different environment.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) or check System Information to see whether the wireless card is recognized. System Information: <ul style="list-style-type: none"> Network > Wi-Fi > Interfaces Is Wi-Fi service detected in MRI or System Information?	Yes	Go to step 2.		
		No	Go to “Wireless Card Not Recognized” troubleshooting flow.		
2.	Start up computer using an up-to-date, bootable OS X volume. Attempt to reproduce the Wi-Fi performance or connection issue. Does issue persist with known-good OS?	Yes	Go to step 3.		
		No	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and install correct version of OS X. Check for and apply latest software and firmware updates. Verify issue resolved.		
3.	Turn off Bluetooth to eliminate potential interference. Check for other interference such as microwave ovens or cordless phones. See Apple Support article HT1365: AirPort and Bluetooth: Potential sources of interference for wireless devices and networks . Change base station channel. Does the issue persist?	Yes	Go to step 4.		
		No	Issue caused by interference. Remove sources of interference, or use a different Wi-Fi channel or mode (2.4 or 5 GHz). Verify issue resolved.		
4.	Remove LCD panel with glass. Locate the three Wi-Fi antennas and inspect each antenna’s cable and connector for any damage. Are Wi-Fi antenna cables and connectors in good condition?	Yes	Go to step 6.		
		No	Go to step 5.		

	Check	Result	Action	Code	Commodity
5.	Verify whether affected Wi-Fi antenna is available separately as a service part. Is Wi-Fi antenna available as service part?	Yes	Replace affected Wi-Fi antenna. Verify issue resolved.	X03	OTHER ELECTRIC
		No	 <p>ESCALATION REQUIRED.</p> <p>The antenna is part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar. Choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
6.	Locate Wi-Fi antenna connector ports on wireless card and verify that they are not damaged, loosened, or unsoldered. Reseat antenna connectors to wireless card. Make sure connections are secure and correctly aligned. Are Wi-Fi antenna connector ports in good condition and securely seated?	Yes	Go to step 7.		
		No	Replace wireless card. Verify issue resolved.	N17	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
7.	<p>To verify Wi-Fi performance and reliability, start up computer using an up-to-date, bootable OS X, 10.8.4 volume for access to Wireless Diagnostics application. See Apple Support article HT5606: About Wireless Diagnostics to familiarize yourself with wireless diagnostic utilities.</p> <p>Connect to a known-good wireless network and open Wireless Diagnostics > Window > Utilities. Review Utilities > Performance - Quality to evaluate signal quality of wireless connection. Verify signal is good or excellent and transmission rate (Tx Rate) is comparable to another known-good computer of similar type and Wi-Fi specification. Where available switch between 2.4GHz and 5 GHz networks to verify signal quality is comparable to a known good computer. Using a network with a high transmission rate, download a large file from a known-good website or file server. Compare network performance to another known-good computer of similar type and Wi-Fi specification. Verify throughput using Activity Monitor > Network.</p> <p>Are performance and throughput comparable between user's computer and a known-good computer?</p>	Yes	Wi-Fi performance is within specification. Verify issue resolved.		
		No	Go to step 8.		
8.	<p>To completely troubleshoot this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Wireless card • Standalone Wi-Fi antennas (if available) <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 9.		
		No	Replace wireless card. Verify issue resolved.	N14	WIRELESS DEVICE
9.	<p>Substitute a known-good wireless card and retest, comparing performance and throughput of user's computer with known-good computer.</p> <p>Are performance and throughput comparable between computers?</p>	Yes	Replace wireless card. Verify issue resolved.	N14	WIRELESS DEVICE
		No	Go to step 10.		

	Check	Result	Action	Code	Commodity
10.	Substitute known-good Wi-Fi antenna. Connect external display and retest, comparing performance and throughput of user's computer with known-good computer. Repeat with other antennas. Are performance and throughput comparable between computers?	Yes	Go to step 11.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click Help button in GSX toolbar. Choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
11.	Verify whether affected Wi-Fi antenna is available separately as a service part. Is Wi-Fi antenna available as service part?	Yes	Replace affected Wi-Fi antenna. Verify issue resolved.	X03	OTHER ELECTRIC
		No	 <p>ESCALATION REQUIRED.</p> <p>The antenna is part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar. Choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
12.	<ul style="list-style-type: none"> Connect to a known-good wireless network and retest data throughput, checking for adequate transfer speeds. Verify that wireless connection is sustained for several minutes. <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click Help button in GSX toolbar. Choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Wireless Card Not Recognized

Unlikely causes:


Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD), stand, Wi-Fi/Bluetooth antennas

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Wi-Fi cannot be enabled• Wi-Fi is not detected or available in System Information• Bluetooth cannot be enabled• Bluetooth is not detected or available in System Information• Wi-Fi and/or Bluetooth intermittently becomes disabled <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.2. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.3. Start up from recovery partition or an up-to-date, bootable OS X volume, and check for the following:<ul style="list-style-type: none">◦ Wi-Fi network interface presence in System Information and System Preferences > Network.◦ Bluetooth network interface presence in System Information and System Preferences > Bluetooth.4. Using Ethernet network interface, connect to Internet, then check for and apply latest software and firmware updates.5. Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) to see whether wireless card is recognized.	Yes	Go to step 2.		
	Are both Wi-Fi and Bluetooth services detected in MRI?	No	Go to step 4.		
2.	Check Mac Resource Inspector (MRI) to see whether it detects local Wi-fi network(s).	Yes	Go to “WiFi Connection Issues” troubleshooting flow.		
	Does MRI only fail the Wi-Fi Scan test?	No	Go to step 3.		
3.	Determine whether the wireless issue is related to Bluetooth or Wi-Fi functionality.	Bluetooth	Go to “Bluetooth Connection Issues” troubleshooting flow.		
	Is issue related to Bluetooth or Wi-Fi functionality?	Wi-Fi	Go to “WiFi Connection Issues” troubleshooting flow.		
4.	Remove LCD panel with glass. Reseat Wireless Card connection to logic board. Connect an external display, and run MRI or check System Information for Wireless Card presence.	Yes	Issue resolved by reseating wireless card. Verify issue resolved.		
	Are both Wi-Fi and Bluetooth services detected in MRI or System Information?	No	Go to step 5.		

	Check	Result	Action	Code	Commodity
5.	To troubleshoot this issue completely, a known-good wireless card is required.	Yes	Go to step 6.		
	Do you have immediate access to a known-good wireless card?	No	Replace wireless card. Verify issue resolved.	N18	WIRELESS DEVICE
6.	Substitute a known-good wireless card. Connect an external display and run MRI or check System Information for wireless card presence.	Yes	Replace wireless card. Verify issue resolved.	N18	WIRELESS DEVICE
	Are both Wi-Fi and Bluetooth services detected in MRI or System Information?	No	Go to step 7.		
7.	Determine whether issue is related to Bluetooth or Wi-Fi functionality.	Bluetooth	Replace logic board. Reinstall user's wireless card. Verify issue resolved.	M36	MLB
	Is issue related to Bluetooth or Wi-Fi functionality?	No	Replace logic board. Reinstall user's wireless card. Verify issue resolved.	M35	MLB
8.	<ul style="list-style-type: none"> • Verify that Wi-Fi network service appears in System Information and can be enabled in System Preferences > Network. • Verify that Bluetooth network interface appears in System Information and can be enabled in System Preferences > Bluetooth. • Connect to a known-good wireless network, and retest data throughput, checking for adequate transfer speeds. • Verify that wireless connection is sustained for several minutes. • Pair with a known-good Bluetooth peripheral. Verify that connection remains functional for several minutes. 	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	N99	
	Is issue resolved?				

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Backlight Issue / No Backlight

Unlikely causes:

AirPort/Bluetooth card, AirPort antenna(s), battery, camera, camera/microphone/ALS cable, CPU fan, hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD)/flash storage card, stand

Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none">• Display not illuminated.• Flickering, unstable, or non-uniform background lighting.• Poor backlight at some or all settings.• Computer exhibits power, Power-On Self-Test (POST) chime and fan movement. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check for and apply the latest software and firmware updates.2. Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and verify that the correct version and build of OS X is installed.3. Cover ambient light sensor to mimic a dark room, and adjust brightness to maximum setting using F2 key on wired keyboard.4. Reset PRAM by holding down Command-Option-P-R keys while rebooting until you hear the startup sound for the second time.5. Reset the SMC using the procedure for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).6. Put the computer to sleep by pressing Control-Shift-Eject. Wake it by pressing any key.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect a compatible external display. Check to see whether the external display mirrors the backlight issue or shows any video at all. Does the external display show a video signal of any kind?	Yes	Go to step 2.		
		No	Go to “Blank/No Video” troubleshooting flow.		
2.	Check Mac Resource Inspector (MRI) results to verify that the LCD is detected. You can use Gateway Manager to access log files on the Apple Service Toolkit (AST) server if there is no video image. Consult the AST Reference Guide for more information on using Gateway Manager. If MRI is not available, use System Information to verify that Color LCD appears in the Display device tree. Does MRI or System Information detect the LCD?	Yes	Go to step 3.		
		No	Go to “Blank/No Video” troubleshooting flow.		
3.	Shine bright (low-heat) flashlight onto front of LCD. With computer powered on, verify whether a faint image is visible. Does display show a video signal despite not being backlit?	Yes	Go to step 4.		
		No	Go to “Blank/No Video” troubleshooting flow.		

	Check	Result	Action	Code	Commodity
4.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Replace the LCD panel with glass, which includes the display power cable. Verify issue resolved.	L09	LCD
	Inspect display power cable and its connectors between logic board and LCD panel with glass.	No	Go to step 5.		
	Is the cable damaged?				
5.	Reseat display power cable between logic board and LCD panel with glass. Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button to start up computer.	Yes	Issue resolved by reseating display power cable. Verify issue resolution.		
	CAUTION: Be extremely careful when working inside the computer when power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.				
	For additional safety information and tips, refer to Apple Support articles: <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety 	No	Go to step 6.		
	Is normal video restored?				
6.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Replace DisplayPort cable. Verify issue resolved.	X03	INTERNAL CABLE
	Inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins.	No	Go to step 7.		
	Is DisplayPort cable or its connector damaged?				
7.	Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 8.		
	Is logic board cable connector damaged?				
8.	Reseat the DisplayPort cable between LCD panel and logic board.	Yes	Issue resolved by reseating DisplayPort cable. Verify issue resolution.		
	CAUTION: Be extremely careful when working inside the computer when power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.				
	Is normal video restored?	No	Go to step 9.		

	Check	Result	Action	Code	Commodity
9.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to Apple Support article TP981: iMac (27-inch, Late 2012 and Late 2013): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 10.		
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
10.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 11.		
11.	<p>To troubleshoot this issue completely, a known-good LCD panel with glass is required.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 12.		
		No	Replace the LCD panel with glass. Verify issue resolved.	L03	LCD
12.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass.</p> <p>Is normal video restored?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
		No	Go to step 13.		
13.	<p>To troubleshoot this issue completely, a known-good logic board is required.</p> <p>Do you have immediate access to a known-good logic board?</p>	Yes	Go to step 14.		
		No	Replace logic board. Verify issue resolved.	M25	MLB

	Check	Result	Action	Code	Commodity
14.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good logic board.</p> <p>Is normal video restored?</p>	Yes	Replace logic board. Verify issue resolved.	M25	MLB
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Power But Blank/No Video

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, CPU fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card


Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none">Power available, but no video visible on display.Fan or hard drive spinning sounds are audible.Caps Lock key LED illuminates when pressed. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Press F2 key to increase screen brightness.Reset SMC using the procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.Disconnect all peripherals.Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.Use Apple Service Toolkit (AST) to run MRI on this UUT, and examine the result logs from the Diagnostic Gateway to determine OS and build version of the customer's computer. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. Start up computer using known-good up-to-date, bootable OS X volume.	Yes	Go to step 3.		
	Does computer make an audible startup sound?	No	Go to step 2.		
2.	While starting up from known-good up-to-date, bootable OS X volume, check whether computer has a memory error (a series of beep tones during startup).	Yes	Go to "Will Not Start Up" troubleshooting flow.		
	Does computer make error tones during startup?	No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	<p>Determine whether issue is no backlight or no LCD image:</p> <ul style="list-style-type: none"> Image with no backlight can be seen by shining a low-heat light source onto the built-in display during or after startup. No image can be identified by a blank display with or without backlight or a solid color on the built-in display. 	No Backlight	Go to “Backlight Issue / No Backlight” troubleshooting flow.		
		No Image	Go to step 4.		
	Is the issue no backlight or no image?				
4.	<p>Connect a known-good external display and press power button. Hold down Command-R during startup to restart from the recovery partition. Toggle video mirroring (Command-F1) to view main screen startup screen on external display. Verify that video is correct when viewed on external display.</p>	Yes	Go to step 5.		
		No	Go to step 10.		
	Is correct image visible on external display?				
5.	<p>Use one of the methods below to determine whether the user's computer recognizes its built-in LCD display panel.</p> <p>METHOD 1: Review MRI results or System Information > Graphics/Displays. Look for information indicating internal display presence in results.</p> <p>METHOD 2: Locate diagnostic LEDs on logic board. Connect a known-good external display and press power button. During startup, computer should communicate with video controller and light diagnostic LED #4 to indicate an active LCD display panel.</p> <p>Note: LED #4 may not light with LCD panel removed.</p>	Yes	Go to step 10.		
		No	Go to step 6.		
	Is built-in LCD panel detected?				
6.	<p>Inspect DisplayPort cable and connectors for damage. Also inspect connectors on LCD panel and logic board.</p>	Yes	Go to step 7.		
		No	Go to step 8.		
	Did you find any damaged components?				

	Check	Result	Action	Code	Commodity
7.	<p>Damage to multiple parts requires an escalation to TSPS for approval for repair.</p> <p>Is damage limited to DisplayPort cable only?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	L99	
8.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to Apple Support article TP981: iMac (27-inch, Late 2012 and Late 2013): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 9.		
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
9.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>If any known-good cables are still installed from previous steps, continue using known-good cables to help find faulty module.</p> <p>Does LCD present video with or without backlight?</p>	With Backlight	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No Backlight	Replace the LCD panel with glass. Verify issue resolved.	L03	LCD
10.	<p>With AC power cord connected and power button pressed, diagnostic LEDs #1 and #2 should be on. This indicates power to computer.</p> <p>Are diagnostic LEDs #1 and #2 on?</p>	Yes	Go to step 11.		
		No	Go to "No Power" troubleshooting flow.		

	Check	Result	Action	Code	Commodity
11.	Disconnect DisplayPort cable from logic board. Connect a known-good external display and press power button. Hold down Command-R during startup to restart from recovery partition. Toggle video mirroring (Command-F1) to view main screen startup screen on external display. Verify that video is correct when viewed on external display. Is correct image visible on external display?	Yes	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
		No	Replace logic board. Verify issue resolved.	M03	MLB
12.	Restart the computer and verify that the video is fully functional. Is the issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	L99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Display Anomalies

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"> • Incorrect or missing colors • Non-uniform brightness • Distorted/blurred image • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"> 1. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: About OS X Recovery. 2. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. 3. Check System Preferences > Displays > Color for possible use of a custom display profile. Ensure profile is set to "iMac". 4. Check the brightness setting. 5. Check for and apply latest software and firmware updates, especially those that deal with display or graphic issues. Remember that some external Apple display adapters also contain firmware that may need updating. For more information, refer to the following Apple Support articles: <ul style="list-style-type: none"> ◦ HT1573: Troubleshooting issues with video on internal or external displays ◦ HT1599: Installing available updates 6. Clean glass panel and check for dust or debris. 7. Reset PRAM by holding down Command-Option-P-R keys while restarting until you hear startup sound for the second time. 8. Reset SMC using procedure listed for this computer in Apple Support article HT3964: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to step 36.		
	<p>Of the seven issues below, verify that "Incorrect or missing colors" best describes the primary symptom:</p> <ul style="list-style-type: none"> • Incorrect or missing colors • Non-uniform brightness • Distorted/blurred image • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges <p>Is incorrect or missing colors the primary display issue?</p>	No	Go to step 2.		

	Check	Result	Action	Code	Commodity
2.	Set desktop pattern in System Preferences > Desktop & Screen Saver > Desktop to Solid Gray Light to verify that issue is non-uniform brightness. Observe display behavior.	Yes	Go to step 32.		
	Of the six issues below, verify that "Non-uniform brightness" best describes the primary symptom:	No	Go to step 3.		
	<ul style="list-style-type: none"> • Non-uniform brightness • Distorted/blurred image • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges 				
	Is non-uniform brightness the primary display issue?				
3.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to step 23.		
	Of the five issues below, verify that "Distorted/blurred image" best describes the primary symptom:	No	Go to step 4.		
	<ul style="list-style-type: none"> • Distorted/blurred image • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges 				
	Is a distorted or blurred image the primary display issue?				
4.	Use Apple Service Toolkit Test Pattern Tools (TPT) test to identify any pixel anomalies. Examine display using solid white, red, green, and blue screens to reveal bright and dark subpixel anomalies or foreign material trapped within display.	Yes	Go to step 21.		
	Refer to Apple Support article HT4044: About LCD display pixel anomalies for Apple products released in 2010 and later to determine whether number of anomalies exceeds specification.	No	Go to step 5.		
	Of the four issues below, verify that "Pixel anomalies" best describes the primary symptom:				
	<ul style="list-style-type: none"> • Pixel anomalies • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges 				
	Are pixel anomalies the primary display issue?				

	Check	Result	Action	Code	Commodity
5.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to "Unstable Flickering" troubleshooting flow.		
	Of the three issues below, verify that "Unstable flickering" best describes the primary symptom: <ul style="list-style-type: none"> • Unstable flickering • Vertical/horizontal lines • Light leakage around display edges 	No	Go to step 6.		
	Is unstable flickering the primary display issue?				
6.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to step 11.		
	Of the two issues below, verify that "Vertical/horizontal lines" best describes the primary symptom: <ul style="list-style-type: none"> • Vertical/horizontal lines • Light leakage around display edges 	No	Go to step 7.		
	Are vertical or horizontal lines the primary display issue?				
7.	Compare an image on user's display with the same image on an equivalent, known-good computer display.	Yes	Go to step 8.		
	Verify that "Light leakage around display edges" best describes primary symptom.				
	Customers may report that sides of the display appear to glow when they view it in a dimmed room, particularly when viewing dark or black images.	No	LCD seems to be within specifications. Do not replace LCD panel with glass. Verify resolution.		
	Is light leakage around display edges the primary display issue?				
8.	Launch the Test Pattern Tool (TPT) within AST to display the All Black display test pattern.	Yes	Go to step 9.		
	It is very important that you verify this issue using ONLY an all black display test pattern with no other images present such as icons, dock, etc.				
	Adjust display position and brightness to normal settings.	No	Explain to user that display is within specifications. Do not replace LCD panel with glass. Verify resolution.		
	Dim lights so you can more clearly see any light leakage around edges of the LCD display.				
	Is any noticeable light leakage present around edges of the display?				

	Check	Result	Action	Code	Commodity
9.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Carefully disconnect and remove LCD panel with glass.</p> <p>Carefully clean all surfaces of any leftover tape or adhesive residue where panel contacts enclosure edges to ensure a good seal and a flat mating surface when display is reseated to these surfaces.</p> <p>Remove and closely inspect chin strap for any damage, bowing, or bending.</p> <p>Verify that all cushioned pads are securely installed on each end of the chin strap and are not damaged, torn, out of place, or missing. These pads are part of the chin strap.</p> <p>Does chin strap appear damaged, bent, or bowed?</p>	Yes	Replace chin strap. Reinstall user's LCD display with glass. Verify issue resolved.	X13	PIECE PART
		No	Go to step 10.		
10.	<p>Recheck that previous disassembly was performed properly using proper tools and techniques and not by simply pulling display off. Incorrect removal technique can damage or bow chin strap, causing light leakage in lower display area.</p> <p>Reinstall chin strap, being very careful to not damage, bow, or otherwise bend chin strap during installation.</p> <p>Reapply new foam tape gaskets for all four display sides, being very careful to apply the tape smoothly around entire edge.</p> <p>Reinstall LCD panel with glass, being careful when seating edges of display against foam-backed tape around edges to ensure a smooth, complete seal around entire perimeter.</p> <p>Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button to start up computer.</p> <p>Recheck for light leakage using TPT within AST to display All Black display test pattern.</p> <p>Is any noticeable light leakage still present around edges of display?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L28	LCD
		No	Issue resolved by reseating display and chin strap. Verify issue resolution.		
11.	Connect an external compatible display.	Yes	Go to step 12.		
	Are vertical and/or horizontal lines present on external display?	No	Go to step 16.		

	Check	Result	Action	Code	Commodity
12.	Vertical and/or horizontal lines may be related to a failing memory module. Watch closely during startup sequence for exact point at which issue starts to occur. Does issue occur BEFORE or AFTER Apple logo and spinning gear appears?	Before	Go to step 16.		
		After	Go to step 13.		
13.	To start up into Safe Mode, press power button; then as soon as you hear startup sound, hold down Shift key. Shift key should be held as soon as possible after startup sound, but not before sound. Release Shift key when you see gray Apple icon and the spinning gear. Does issue still occur in Safe Mode?	Yes	Go to step 16.		
		No	Go to step 14.		
14.	Perform one-by-one replacement of user's memory modules with known-good memory, reassemble and retest. Depending on computer model, this may simply require removal of the rear door, or the removal of LCD display and logic board to access the memory modules. Note: Be sure to always have at least the minimum amount of memory installed to support computer and its OS. This may mean replacing a memory module with a known-good one of larger capacity for testing. For example, you may need to replace a 1 GB module with a known-good 2 GB module to support starting into OS X. Does issue occur only with specific memory module(s)?	Yes	Replace memory module(s). Note: Only replace defective memory module(s). There is no need to replace memory in pairs. Verify issue resolved.	X06	MEMORY
		No	Go to step 15.		
15.	Install a known-good memory module in one memory slot and retest. Repeat test with known-good memory for each additional memory slot, one at a time. Does issue occur only with a specific memory slot on the logic board?	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M04	MLB
		No	Go to step 16.		
16.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Remove LCD panel with glass and inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins. Is DisplayPort cable or its connector damaged?	Yes	Go to step 44.		
		No	Go to step 17.		

	Check	Result	Action	Code	Commodity
17.	Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins. Is logic board cable connector damaged?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 18.		
18.	To troubleshoot this issue completely, a known-good LCD panel with glass is required. Do you have immediate access to a known-good LCD panel with glass?	Yes	Go to step 19.		
		No	Go to step 20.		
19.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass to test logic board video output.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Is normal video restored?</p>	Yes	Go to step 20.		
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M04	MLB
20.	Examine image on display and determine whether lines are vertical or horizontal. Are lines vertical or horizontal?	Vertical	Replace LCD panel with glass. Verify issue resolved.	L27	LCD
		Horizontal	Replace LCD panel with glass. Verify issue resolved.	L26	LCD
21.	Inspect display closely and determine whether pixel "anomalies" are actually dust or debris on surface of glass panel. Are anomalies caused by dust, debris, or other surface contamination?	Yes	Clean glass panel. Verify issue resolved.		
		No	Go to step 22.		
22.	Refer to Apple Support article HT4044: About LCD display pixel anomalies for Apple products released in 2010 and later to determine whether number of anomalies exceeds specification. Determine whether number of bright or dark pixel anomalies (or a combination of these) exceed specification. Does the number of pixel anomalies exceed the specified limit?	Yes	Replace LCD panel with glass. Verify issue resolved.	L20	LCD
		No	Explain to user that display is within specifications. Do not replace LCD panel with glass. Verify resolution.		


	Check	Result	Action	Code	Commodity
23.	Connect a compatible external display.	Yes	Go to step 24.		
	Does image on external display appear distorted and/or blurred?	No	Go to step 28.		
24.	A distorted or blurred image may be related to a failing memory module. Watch closely during startup sequence for exact point at which issue starts to occur.	Before	Go to step 28.		
	Does issue occur BEFORE or AFTER Apple logo and spinning gear appears?	After	Go to step 25.		
25.	To start up into Safe Mode, press power button; then as soon as you hear startup sound, hold down Shift key. Shift key should be held as soon as possible after startup sound, but not before sound. Release Shift key when you see gray Apple icon and the spinning gear.	Yes	Go to step 28.		
	Does issue still occur in Safe Mode?	No	Go to step 26.		
26.	Perform one-by-one replacement of user's memory modules with known-good memory, reassemble and retest. Depending on computer model, this may simply require removal of the rear door, or the removal of LCD display and logic board to access the memory modules. Note: Be sure to always have at least the minimum amount of memory installed to support the computer and its OS. This may mean replacing a memory module with a known-good one of larger capacity for testing. For example, you may need to replace a 1 GB module with a known-good 2 GB module to support starting into OS X.	Yes	Replace memory module(s). Note: Only replace defective memory module(s). There is no need to replace memory in pairs. Verify issue resolved.	X06	MEMORY
	Does issue occur only with specific memory module(s)?	No	Go to step 27.		
27.	Install a known-good memory module in one memory slot and retest. Repeat test with known-good memory for each additional memory slot, one at a time.	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M04	MLB
	Does issue occur only with a specific memory slot on logic board?	No	Go to step 28.		
28.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Go to step 46.		
	Remove LCD panel with glass and inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins. Is DisplayPort cable or its connector damaged?	No	Go to step 29.		

	Check	Result	Action	Code	Commodity
29.	Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins. Is logic board cable connector damaged?	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 30.		
30.	To completely troubleshoot this issue, a known-good LCD panel with glass is required. Do you have immediate access to a known-good LCD panel with glass?	Yes	Go to step 31.		
		No	Replace LCD panel with glass. Verify issue resolved.	L04	LCD
31.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass to test logic board video output.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Is normal video restored?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L04	LCD
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M04	MLB
32.	Determine whether variation in uniformity appears excessive when compared to a known-good similar computer. Does non-uniform brightness exceed that of a known-good computer?	Yes	Go to step 33.		
		No	LCD seems to be within specifications. Do not replace LCD panel with glass. Verify resolution.		
33.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove LCD panel with glass. Inspect for mechanical interference from screws or cables making contact with back of LCD panel. Reseat components & cables.</p> <p>Carefully clean all surfaces of any leftover tape or adhesive residue where panel contacts enclosure edges to ensure a good seal and a flat mating surface when display is resealed to these surfaces.</p> <p>Is normal video restored?</p>	Yes	Issue resolved by reseating internal components. Verify issue resolution.		
		No	Go to step 34.		

	Check	Result	Action	Code	Commodity
34.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Inspect and reseal backlight cable.</p> <p>Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button to start up computer.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Is normal video restored?</p>	Yes	Issue resolved by reseating backlight cables. Verify issue resolution.		
		No	Go to step 35.		
35.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Reseat DisplayPort cable connector securely to logic board. Reconnect all internal cables and reinstall LCD panel. Retest.</p> <p>Is normal video restored?</p>	Yes	Issue resolved by reseating DisplayPort cable. Verify issue resolution.		
		No	Replace LCD panel with glass. Verify issue resolved.	L21	LCD
36.	<p>Verify that display is listed in System Information > Hardware > Graphics/Displays > Video Card. This ensures that color profile can be matched with LCD.</p> <p>Is display hardware detected?</p>	Yes	Go to step 37.		
		No	Go to step 38.		
37.	<p>Go to System Preferences > Displays > Color to make sure "iMac" is selected under Display profile. Inspect display again for incorrect or missing colors.</p> <p>Are colors still incorrect or missing when display profile is set to "iMac"?</p>	Yes	Go to step 38.		
		No	Issue resolved by setting a valid display profile. User may have created an off-color calibration setting. Verify resolution.		
38.	<p>Run Mac Resource Inspector (MRI) to check for LCD presence.</p> <p>Is LCD detected (green) in MRI?</p>	Yes	Go to step 40.		
		No	Go to step 39.		

	Check	Result	Action	Code	Commodity
39.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Reseat DisplayPort cable connector securely to logic board and retest.</p> <p>Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button to start up computer.</p> <p>CAUTION: Be extremely careful when working inside the computer with power applied and the system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Is normal video restored?</p>	Yes	Issue resolved by reseating DisplayPort cable. Verify resolution.		
		No	Go to step 40.		
40.	<p>Set desktop pattern in System Preferences > Desktop & Screen Saver > Desktop > Solid Colors to Solid Gray Light. Check to see whether incorrect/missing color issue affects entire screen.</p> <p>Is entire screen affected?</p>	Yes	Go to step 42.		
		No	Go to step 41.		
41.	<p>Put computer side-by-side with a known-good equivalent iMac display showing same Solid Gray Light image.</p> <p>Is issue noticeably worse on the user's display?</p>	Yes	Go to step 42.		
		No	Small variations in color uniformity are normal and do not warrant replacement of display.		
42.	<p>To troubleshoot this issue completely, a known-good LCD panel with glass is required.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 43.		
		No	Replace LCD panel with glass. Verify issue resolved.	L02	LCD
43.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass to test logic board video output.</p> <p>Is normal video restored?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L02	LCD
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M04	MLB

	Check	Result	Action	Code	Commodity
44.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to Apple Support article TP981: iMac (27-inch, Late 2012 and Late 2013): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 45.		
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
45.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 17.		
46.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to Apple Support article TP981: iMac (27-inch, Late 2012 and Late 2013): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 47.		
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
47.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 29.		

	Check	Result	Action	Code	Commodity
48.	<p>Verify that display issue or anomaly has been resolved.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): No Video to External Display


Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card.

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">External display is not detected when connected to computerExternal display does not show any video <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Connect a known-good, compatible external display to computer's video-out port. Review Apple Support article HT3235: About Apple video adapters and cables to help identify which adapters can be used with this computer model.2. If using an Apple Thunderbolt Display, review Apple Support article HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ) to identify which computer models support it.3. Review Apple Support article HT1573: Apple computers: Troubleshooting issues with video on internal or external displays for common causes of video issues.4. Launch System Information > Hardware > Graphics/Displays, select video card where internal Color LCD display is connected, and verify that external display hardware is recognized.5. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.6. Check for and apply latest software and firmware updates to all involved computer(s) and display(s) (if applicable).7. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. Refer to Apple Support article HT1895: When to reset NVRAM or PRAM.8. If using with a computer set in target display mode, check that Thunderbolt cable is made by Apple (not third party) and that computer intended for use as target display actually supports target display mode via Thunderbolt. Refer to Apple Support article HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ).9. If using with a computer set in target display mode, reset SMC on computer used as a display. Refer to Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).10. If using an Apple Thunderbolt Display, review Apple Support article HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ) to verify that the computer has the latest Thunderbolt firmware version installed. Also review Apple Support article HT4614: About Thunderbolt to Thunderbolt cable (2 m) for details on Thunderbolt cable usage and supported configurations.11. If using a Mini DisplayPort adapter, review Apple Support article HT3382: Apple Mini DisplayPort adapters: Frequently asked questions (FAQ), for details on supported configurations.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect video-out port for dust, debris, damage, or bent pins that might cause display cable to make insufficient contact. Use compressed air to remove any debris. Is video-out port damaged?	Yes	Go to step 2.		
		No	Go to step 4.		
2.	Inspect logic board, video-out port, and enclosure for dents, scratches, or other indications of impact or abuse. Can you identify signs of accidental damage?	Yes	Go to step 3.		
		No	Replace logic board. Verify issue resolved.	M24	MLB
3.	Inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options Does the user want to proceed with out-of-warranty repair?	Yes	Replace the logic board. Verify issue resolved.	M24	MLB
		No	Issue resolved. Return computer to user using correct positioning.		
4.	Connect known-good, compatible external display. Start up from a known-good up-to-date bootable OS X volume and check System Information > Hardware > Graphics/Displays device tree for presence of external display connected to graphics card. Is external display detected?	Yes	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and reinstall correct OS X build for this computer model. Verify issue resolved.		
		No	Replace logic board. Verify issue resolved.	M26	MLB
5.	Connect a known-good, compatible display to computer. <ul style="list-style-type: none"> Verify display is functional at computer startup. Verify display is functional after computer is put to sleep and then awakened. Verify other display features are also available (depending on display model: USB, audio, USB, Ethernet, and so forth). Is issue resolved?	Yes	Issue resolved.		
		No	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Thunderbolt Target Display Mode Issues

Unlikely causes:


Battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card



Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none">• Computer does not initiate Thunderbolt target display mode connection• Thunderbolt-capable iMac does not switch to display mode when you press Command-F2 (target display mode trigger) on the iMac keyboard <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check that Thunderbolt cable is made by Apple (not third party) and that computer intended for use as target display supports target display mode via Thunderbolt. Refer to Apple Support article HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ).2. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller.3. Check for and apply latest software and firmware updates on both computers.4. Check System Information > Hardware > Thunderbolt to verify that Thunderbolt hardware is recognized.5. Try a known-good Thunderbolt to Thunderbolt cable (2 m).6. Review the section entitled "How do I get the best performance from Thunderbolt?" in Apple Support article HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ) to verify that computer has latest Thunderbolt firmware version installed.7. See Apple Support article HT4614: About Thunderbolt to Thunderbolt cable (2.0 m).8. Make sure an Apple aluminum keyboard (wired or wireless) is being used. Earlier Apple and third-party keyboards will not activate Thunderbolt Target Display mode when pressing Command-F2.9. Try using a known-good Thunderbolt-capable computer for target display mode. Refer to PH11302: OS X Mountain Lion: Use another Mac as a display.10. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.11. Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller.</p> <p>Is proper OS X build installed?</p>	Yes	Go to step 2.		
		No	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and reinstall correct OSX build and USB drivers for this computer model. Use Software Update to make sure newest revisions are installed. Verify issue resolved.		
2.	<p>Apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as iMac, with unique user ID (UID) and firmware version shown.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Go to step 4.		
		No	Go to step 3.		
3.	<p>Reset PRAM by holding down the Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.</p> <p>Does System Information list Thunderbolt hardware?</p>	Yes	Go to step 4.		
		No	Go to “Thunderbolt Not Recognized” troubleshooting flow.		
4.	<p>Inspect Thunderbolt port(s) on user's computer for physical damage, burnt connectors, or misalignment.</p> <p>Does Thunderbolt port show any damage?</p>	Yes	Go to step 5.		
		No	Go to step 6.		
5.	<p>Check that physical damage or improper logic board mounting has not caused Thunderbolt ports to be out of alignment. Connect a Mini DisplayPort connector to Thunderbolt ports while mounting logic board to ensure proper alignment for cable insertion and removal. Rule out accidental damage before proceeding.</p> <p>Did logic board realignment correct Thunderbolt port issue?</p>	Yes	Go to step 6.		
		No	Replace logic board. Verify issue resolved.	M24	MLB

	Check	Result	Action	Code	Commodity
6.	<p>To troubleshoot this issue completely, the following known-good parts are required:</p> <ul style="list-style-type: none"> Thunderbolt-capable Mac Thunderbolt to Thunderbolt cable (2m) <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 7.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Request TSPS help checking latest updates and System Information > Hardware > Thunderbolt device tree.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>		
7.	<p>Connect a known-good Thunderbolt to Thunderbolt cable (2 m) between user's computer and known-good Thunderbolt-capable iMac. Start up both computers to desktop, then press Command-F2 on known-good iMac to activate target display mode for user's computer. Verify all available Thunderbolt ports.</p> <p>Does known-good iMac become a target display for user's computer?</p>	Yes	Go to step 10.		
		No	Go to step 8.		
8.	<p>Check System Information > Hardware > Thunderbolt on user's computer to verify Thunderbolt port connection and port status. The connection to the known-good iMac should show as "Macintosh."</p> <p>Hardware > Graphics > Displays should show any displays recognized by user's computer and list Color LCD and iMac display information.</p> <p>Does System Information list target display mode information?</p>	Yes	Go to step 9.		
		No	Replace logic board. Verify issue resolved.	M32	MLB

	Check	Result	Action	Code	Commodity
9.	<p>Reseat both ends of known-good Thunderbolt to Thunderbolt cable (2 m). Shut down both computers, then start up to desktop. Press Command-F2 on known-good iMac to activate target display mode for user's computer. Verify that video from user's computer is visible on target display iMac.</p> <p>Check System Information > Hardware > Graphics > Displays on user's computer to see if Color LCD and display iMac are present and activated.</p> <p>Verify all available Thunderbolt ports.</p> <p>Does System Information list target display mode information?</p>	Yes	Go to step 10.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Inform TSPS that user's computer cannot activate target display mode on a known-good Thunderbolt iMac while it does show connection to Thunderbolt device tree.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
10.	<p>Continue using known-good Thunderbolt to Thunderbolt cable (2 m) between user's computer and known-good iMac. Shut down, then start up both computers to desktop. Press Command-F2 on user's iMac to activate target display mode for known-good iMac. Verify that video from known-good iMac is visible on target display of user's iMac. Check System Information > Hardware > Graphics > Displays to see whether Color LCD and user's target display iMac are present and activated on known-good iMac.</p> <p>Is target display video present on user's iMac, and is user's iMac listed in Displays?</p>	Yes	Go to step 11.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Target display mode should work in both directions. Inform TSPS that user's computer cannot be an active target display (as a second display) for known-good Thunderbolt iMac.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
11.	<p>Inspect user's Thunderbolt to Thunderbolt (2 m) cable for physical damage, such as contamination or burnt connectors on either end of cable.</p> <p>Is user's Thunderbolt cable damaged?</p>	Yes	Replace Thunderbolt to Thunderbolt (2m) cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Go to step 12.		
12.	<p>Connect user's Thunderbolt to Thunderbolt (2 m) cable from user's computer to a known-good Thunderbolt-capable iMac. Start up both computers to desktop, then press Command-F2 on known-good iMac to activate target display mode for user's computer.</p> <p>Does known-good iMac become a target display for user's computer?</p>	Yes	Issue resolved. Verify resolution.		
		No	Replace Thunderbolt to Thunderbolt (2m) cable. Verify issue resolved.	X03	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
13.	<p>Check System Information to confirm that Thunderbolt hardware is recognized and has a unique UID. Confirm current firmware version and link status.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Unstable Flickering

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, hard disk drive (HDD), HDD data cable, HDD power cable, left speaker, memory, power supply, rear enclosure, right speaker, solid-state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antennas, wireless card


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Flickering video image• Flickering backlight• Dock and/or menu bar position not stable• Display intermittently flashes on/off• Unstable image <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.2. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.3. Check brightness setting.4. Check for and apply latest software and firmware updates, especially those that deal with display issues. Remember that some external Apple display adapters also contain firmware that may need updating. For more information, refer to the following Apple Support articles:<ul style="list-style-type: none">• HT1573: Apple computers: Troubleshooting issues with video on internal or external displays• HT1599: Intel-based iMac: Installing available updates5. Clean glass panel and check for dust or debris.6. Reset PRAM by holding down Command-Option-P-R keys while starting up until you hear the startup sound for the second time.7. Reset SMC using the procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).


Deep Dive

	Check	Result	Action	Code	Commodity
1.	Adjust built-in display brightness setting to low backlight level, just above off.	Backlight	Go to step 2.		
	Verify whether user issue is due to backlight flickering or to an unstable or flickering video image on LCD.				
	You may need to shine a bright (low heat) flashlight onto front of LCD with computer powered ON to verify whether a faint video image is occasionally visible through the flickering. Note: If video is present but backlight never turns on, exit this procedure and go to 'No Backlight' issue instead. Use this procedure only for flickering backlight or video image.	Video	Go to step 8.		
	Which is flickering, backlight or video?				

	Check	Result	Action	Code	Commodity
2.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Replace LCD panel with glass, which includes display power cable. Verify issue resolved.	L03	LCD
	Inspect display power cable and its connectors between logic board and LCD panel with glass.	No	Go to step 3.		
	Is display power cable damaged?				
3.	Reseat display power cable between logic board and LCD panel with glass. Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button to start up computer.	Yes	Issue resolved by reseating display power cable. Verify issue resolution.		
	CAUTION: Be extremely careful when working inside the computer while power is connected and system is energized. Avoid touching the logic board or power supply while the computer is plugged in. For additional safety information and tips refer to Apple Support articles: <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety 	No	Go to step 4.		
	Is normal video restored?				
4.	To troubleshoot this issue completely, a known-good LCD panel with glass is required.	Yes	Go to step 5.		
	Do you have immediate access to a known-good LCD panel with glass?	No	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
5.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
	Substitute a known-good LCD panel with glass.	No	Go to step 6.		
	Is normal video restored?				
6.	To troubleshoot this issue completely, a known-good power supply is required.	Yes	Go to step 7.		
	Do you have immediate access to a known-good power supply?	No	Replace power supply. Verify issue resolved.	P99	POWER SUPPLY

	Check	Result	Action	Code	Commodity
7.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good power supply.</p> <p>Is normal video restored?</p>	Yes	Replace power supply. Verify issue resolved.	P99	POWER SUPPLY
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
8.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove LCD panel with glass and inspect DisplayPort cable for misrouting. Disconnect DisplayPort cable from logic board. Inspect cable for pinching and cable connector for damaged or bent pins.</p> <p>Is DisplayPort cable or its connector damaged?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 9.		
9.	<p>Keep DisplayPort cable disconnected from logic board. Inspect DisplayPort connector on logic board for damaged or bent pins.</p> <p>Is logic board cable connector damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 10.		
10.	<p>Reseat DisplayPort cable between LCD panel and logic board. Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button to start up computer.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is connected and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Is normal video restored?</p>	Yes	Issue resolved by reseating DisplayPort cable. Verify issue resolution.		
		No	Go to step 11.		

	Check	Result	Action	Code	Commodity
11.	<p>To troubleshoot this issue completely, a known-good DisplayPort cable is required. The iMac Display Extension Cable Kit contains an embedded DisplayPort (eDP) substitution cable that can be used for testing.</p> <p>Refer to Apple Support article TP981: iMac (27-inch, Late 2012 and Late 2013): Testing the Panel Using the Display Extension Cable Kit or TP982: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Testing the Panel Using the Display Extension Cable Kit for information about how to use extension cables.</p> <p>Do you have immediate access to a known-good DisplayPort cable?</p>	Yes	Go to step 12.		
		No	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
12.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good eDP cable or use the eDP substitution cable found in the extension cable kit in place of suspect eDP cable.</p> <p>Is normal video restored?</p>	Yes	Replace DisplayPort cable. Verify issue resolved.	L14	INTERNAL CABLE
		No	Go to step 13.		
13.	<p>To troubleshoot this issue completely, a known-good LCD panel with glass is required.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 14.		
		No	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
14.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass.</p> <p>Is normal video restored?</p>	Yes	Replace LCD panel with glass. Verify issue resolved.	L03	LCD
		No	Replace logic board. Reinstall user's LCD panel with glass. Verify issue resolved.	M29	MLB

	Check	Result	Action	Code	Commodity
15.	<p>Confirm that the computer display flickering or unstable video issue is resolved.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	L99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Audio-in Jack Issues


Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, right speaker, solid-state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antennas, wireless card


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">External audio-in port does not work with an analog or digital line-level source <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Press F12 key on keyboard to make sure that audio output is not muted.Ask user which type of audio input cable is connected to the computer's audio in jack: analog or optical cable.Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Update or restore if needed.Check that a known-good audio cable is used with its analog 3.5mm stereo miniplug end connected to proper input on computer and its other end connected to a compatible line-level audio source.Check that a known-good analog audio device (such as an iPod, iPhone, or other Mac computer) is used as source and is playing audio.On user's computer, go to System Preferences > Sound and verify the following:<ul style="list-style-type: none">Input tab:<ul style="list-style-type: none">Line In input source is available and selected when an analog audio source is connected."Input volume" slider is not set to zero (available only with an analog audio input).Output tab:<ul style="list-style-type: none">Sound output device is set to Internal Speakers.Output volume is not muted or set to zero.Open QuickTime Player. Choose New Audio Recording from File menu. Choose "Built-in Input: Line In" input source from right pop-up menu, and adjust sound volume using slider in center of window.If audio is heard, verify user's cable and audio device using same process. Note: Disconnecting an analog stereo miniplug cable from the iPod/iPhone side will pause the audio playback.Perform visual and mechanical inspection of audio input and output jacks. Use an otoscope to inspect for dust and/or debris. Use compressed air to clean and remove any dust and/or debris.Reset PRAM by holding down Command-Option-P-R keys while restarting until you hear the startup sound a second time.

Deep Dive


	Check	Result	Action	Code	Commodity
1.	Play a known-good audio file or reliable Internet radio station via iTunes. Verify that sound is clearly audible and free of distortion through both headphones and internal speakers. Does the audio file play correctly?	Yes	Go to step 3.		
		No	Go to step 2.		
2.	Specify whether playback from known-good audio source is distorted or not audible. Is sound distorted or not audible?	Distorted	Go to “Distorted Audio from Internal Speaker(s)” troubleshooting flow.		
		Not Audible	Go to “No Audio from Internal Speakers or Headphone Jack” troubleshooting flow.		
3.	Hold down Command-R during startup to restart from recovery partition, and try to reproduce audio input issue using known-good audio sources and cables. Does audio issue persist with known-good OS?	Yes	Go to step 4.		
		No	Restore OS with correct Mac OS X build: See Apple Support article HT1159: Mac OS X versions (builds) for computers . Verify issue resolution.		
4.	From user information, identify whether analog line-in or optical digital-in is causing issue. Which audio input is affected: analog line-in or optical digital-in?	Analog Line-In	Go to step 5.		
		Optical Digital-In	Go to step 10.		
5.	To troubleshoot this issue completely, a known-good 3.5mm stereo cable is required. Do you have immediate access to a known-good 3.5mm stereo cable?	Yes	Go to step 6.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Computer analog input cannot be tested without adequate 3.5mm male-to-male stereo miniplug cable. See Apple Support article PH3676: PH3676: Mac OS X 10.7 Help: Audio ports for further information.</p>		
6.	Disconnect any cable from audio in (mic) port to verify default setting for audio in. In System Preferences > Sound > Input, verify that the Line In audio input source is listed and that the Input volume slider is present. Set Input volume to middle position. Is Line In audio input available?	Yes	Go to step 8.		
		No	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	<p>Line-in activity appears to be stuck to optical digital-in mode:</p> <ul style="list-style-type: none"> • Insert a 3.5mm stereo miniplug into the audio in port and then rapidly unplug it and plug it in several times to reset internal switches in the connector. • Verify whether System Preferences > Sound > Input reverts to Line In after plug insertion and removal. • Close and reopen Sound Preferences window to refresh list of current audio input sources. <p>Does audio input in System Preferences revert to Line In after minijack insertion and removal?</p>	Yes	Issue resolved by resetting audio-in jack. To prevent the issue from recurring suggest that user check physical specifications of cable connectors previously connected to this jack.		
		No	Go to step 14.		
8.	<p>Play a known-good audio file or Internet radio station in iTunes, and verify that it plays through internal speakers.</p> <p>Connect 3.5mm male-to-male stereo miniplug cable between the audio in (mic) port and the audio out (headphone) port.</p> <p>In System Preferences > Sound > Output verify that Headphones audio output source appears and select it.</p> <p>In System Preferences > Sound > Input, select Line In, then adjust the Input volume slider to observe activity level without peaking at maximum.</p> <p>Does the bar graph at bottom of recording window show input activity?</p>	Yes	Go to step 9.		
		No	Go to step 14.		

	Check	Result	Action	Code	Commodity
9.	Open QuickTime Player and choose New Audio Recording from File menu.	Yes	Computer analog audio input appears to be performing to specifications. Verify issue resolved.		
	<p>In the new recording window, choose "Built-In: Line Input" source from input source right pop-up menu. Adjust volume using slider in center of window.</p> <p>Press record button to start recording. Record for several seconds, then click record button again to stop recording.</p> <p>Disconnect stereo cable from audio out (headphone) port to hear audio through internal speakers. If needed, press F11-F12 keys to adjust volume, and confirm that computer is able to play sound.</p> <p>Stop playing known-good audio file or Internet radio.</p> <p>Play recorded audio file.</p> <p>Does computer accurately reproduce sound recorded from audio input?</p>	No	Go to step 14.		
10.	<p>To troubleshoot this issue completely, a known-good 3.5mm mini-TOSLINK optical cable is required.</p> <p>Do you have immediate access to a known-good 3.5mm mini-TOSLINK cable?</p>	Yes	Go to step 11.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Computer digital input cannot be tested without adequate 3.5mm mini-TOSLINK male-to-male optical cable. See Apple Support article PH3676: Mac OS X 10.7 Help: Audio ports for further information.</p>		
11.	Connect 3.5mm mini-TOSLINK cable to the audio out (headphone) port.	Yes	Go to step 12.		
	<p>In System Preferences > Sound > Output, verify that a Digital Out audio output source appears, and select it.</p> <p>Play a known-good audio file or Internet radio station.</p> <p>Audio out should switch to optical digital audio, and unplugged end of cable will emit a red light to indicate transmission of a digital audio stream.</p> <p>Is red light visible at unplugged end of mini-TOSLINK cable?</p>	No	Go to step 14.		

	Check	Result	Action	Code	Commodity
12.	Continue to play known-good audio.	Yes	Go to step 13.		
	<p>Connect other end of 3.5mm mini-TOSLINK cable to audio in (mic) port.</p> <p>Open QuickTime Player and choose New Audio Recording from File menu.</p> <p>In the new recording window, choose "Built-in Input: Digital In" from the input source pop-up menu, and adjust volume using slider in center of window.</p> <p>Does the bar graph at bottom of the recording window show input activity?</p>	No	Go to step 14.		
13.	Press record button to start recording. Record for several seconds. Press record button again to stop recording.	Yes	Computer digital audio input appears to be performing to specifications. Verify issue resolved.		
	<p>Disconnect optical cable from audio out (headphone) port to hear audio through internal speakers. Press F11 and F12 keys to adjust volume, and confirm that computer is able to play sound.</p> <p>Stop playing known-good audio.</p> <p>Play the recorded audio file.</p> <p>Does computer accurately reproduce sound recorded from audio input?</p>	No	Go to step 14.		
14.	Disconnect cable from audio in (mic). Open QuickTime Player and choose New Audio Recording from the file menu. Choose "Built-in Microphone: Internal Microphone" from the pop-up menu to record from an internal microphone input source. Compare distortion between recorded internal input and external input sources. Is recorded sound also distorted when recorded from internal microphone input?	Yes	Replace logic board. Verify issue resolved.	M09	MLB
		No	Go to step 15.		
15.	Disconnect headphones or external speakers. Remove LCD panel with glass. Inspect audio cable connector and its corresponding connector on logic board. Reseat connection and retest. Is recorded sound audible, clear, and free of distortion?	Yes	Issue resolved by reseating audio cable. Verify resolution.		
		No	Go to step 16.		

	Check	Result	Action	Code	Commodity
16.	<p>To troubleshoot this issue completely, a known-good rear enclosure is required.</p> <p>Do you have immediate access to a known-good rear enclosure?</p>	Yes	Go to step 17.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
17.	<p>Substitute a known-good rear enclosure with audio ports and retest recording.</p> <p>To do this, carefully place known-good rear enclosure near the user's computer, then temporarily plug audio flex cable from known-good rear enclosure into audio connector on the logic board inside user's computer.</p> <p>Is recorded sound audible, clear, and free of distortion?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
18.	Plug a known-good analog audio source into audio in jack, and verify that sound recorded is audible and free of distortion. Repeat with digital (optical) audio source. Is issue resolved?	Yes	Issue resolved.		
		No	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Camera Issues

Unlikely causes:

Battery, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Camera not detected• No green LED for camera• Excessive blooming• Poor white balance• Poor focus• Green image• Image distortion <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check for and apply latest software and firmware updates.2. Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers. Verify that correct version of OS X is installed.3. Verify that camera lens and glass panel are clean and clear of contaminants.4. Ask user about lighting conditions in his or her working environment. Dim lighting causes poor image quality. Overly bright lighting can bounce off surfaces onto subject and make image foggy.5. Striped, textured, and mesh clothing can create moiré patterns in image.6. Reset SMC using procedure for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).7. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.8. Disconnect all USB devices and restart.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) and check test results to verify camera presence.	Yes	Go to step 3.		
	Does MRI detect the camera and LCD display panel?	No	Go to step 2.		
2.	Depending on computer model, the camera will be listed in System Information > Hardware > USB or Camera Device Tree. Verify that "FaceTime HD Camera (Internal)" is listed.	Yes	Go to step 3.		
	Does the camera appear in System Information?	No	Go to step 4.		
3.	Launch Photo Booth. Verify that green LED next to camera lights up. Make sure image looks normal.	Yes	Issue resolved. Verify resolution.		
	Does the camera LED light up and the image appear normal?	No	Go to step 4.		

	Check	Result	Action	Code	Commodity
4.	Check camera/microphone/ALS cable connection to camera and to logic board. Check cable connectors to camera and logic board for loose or broken wires or pins. Does camera cable show any signs of damage?	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 5.		
5.	Inspect camera cable connector on logic board, looking for a missing connector, cracking housing, or bent or broken pins that may have lifted from logic board solder pads. Does logic board connector show any signs of damage?	Yes	Replace logic board. Verify issue resolved.	M13	MLB
		No	Go to step 6.		
6.	Reseat camera cable securely to logic board. Check System Information again. Does camera appear in System Information?	Yes	Go to step 7.		
		No	Go to step 8.		
7.	Launch Photo Booth. Verify that green LED next to camera lights up. Make sure image looks normal. Does camera LED light up and image appear normal?	Yes	Issue resolved by reseating the camera/microphone/ALS cable. Verify resolution.		
		No	Go to step 10.		
8.	To troubleshoot this issue completely, a known-good camera/microphone/ALS cable is required. Do you have immediate access to a known-good Camera/Microphone/ALS Cable?	Yes	Go to step 9.		
		No	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
9.	Substitute a known-good camera/microphone/ALS cable and retest. Is camera working normally?	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 10.		
10.	To troubleshoot this issue completely, a known-good camera is required. Do you have immediate access to a known-good camera?	Yes	Go to step 11.		
		No	Replace camera. Verify issue resolved.	X21	OTHER ELECTRIC
11.	Substitute a known-good camera and retest. Is camera working normally?	Yes	Replace camera. Verify issue resolved.	X21	OTHER ELECTRIC
		No	Go to step 12.		
12.	To troubleshoot this issue completely, a known-good logic board is required. Do you have immediate access to a known-good logic board?	Yes	Go to step 13.		
		No	Replace logic board. Verify issue resolved.	M13	MLB

	Check	Result	Action	Code	Commodity
13.	Substitute a known-good logic board and retest. Is camera working normally?	Yes	Replace logic board. Verify issue resolved.	M13	MLB
		No	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Distorted Audio from Internal Speaker(s)

Unlikely causes:



Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, memory, power supply, stand, Wi-Fi/Bluetooth antennas, wireless card

Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none"> Sound is distorted, fuzzy, crackly, etc. Symptom only appears in internal speaker. Symptom also appears in external speakers/headphones. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"> Test with known-good sound file. Compare same sound and settings against a known-good similar model computer to make sure sound is indeed distorting. In System Preferences > Sound > Output, adjust the Output volume, and use Balance slider to isolate left and right speakers and check if issue only happens with one speaker. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time. If testing with iTunes, make sure both equalizer and preamp settings are set to "Flat". Test audio output using more than one application or website. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up computer using known-good, up-to-date, bootable OS X volume. Play same known-good sound file and compare using internal speakers and known-good headphones or external speakers.	Yes	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and reinstall correct OS X build. Verify resolution.		
	Is internal/external sound now audible, clear, and free of distortion?	No	Go to step 2.		
2.	Play known-good audio file on internal speakers, then connect known-good headphones or external speakers and compare for distortion.	Yes	Go to step 3.		
	Is sound also distorted through headphones or external speakers?	No	Go to step 6.		
3.	Disconnect headphones or external speakers. Remove LCD panel with glass. Inspect audio cable connector and its corresponding connector on logic board. Reseat connection and retest.	Yes	Issue resolved by reseating audio cable. Verify resolution.		
	Is sound from internal/external speakers audible, clear, and free of distortion?	No	Go to step 4.		

	Check	Result	Action	Code	Commodity
4.	<p>To troubleshoot this issue completely, a known-good rear enclosure is required.</p> <p>Do you have immediate access to a known-good rear enclosure?</p>	Yes	Go to step 5.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
5.	<p>Substitute a known-good rear enclosure with audio ports and retest.</p> <p>To do this, carefully place known-good rear enclosure near user's computer, then temporarily plug audio flex cable from known-good rear enclosure into audio connector on logic board inside user's computer.</p> <p>Is sound from internal/external speakers audible, clear, and free of distortion?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Replace logic board. Verify issue resolved.	M09	MLB
6.	<p>Remove LCD panel with glass. Locate affected speaker connection on logic board. Inspect speaker cable connector and its corresponding connector on logic board. Reseat connection and retest.</p> <p>Is sound from affected internal speaker audible, clear, and free of distortion?</p>	Yes	Issue resolved by reseating speaker cable connection. Verify resolution.		
		No	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	Disconnect headphones or external speakers. In System Preferences > Sound > Output, move Balance slider all the way left then all the way right, testing sound output each time. Test full range of volume settings. Listen closely to higher range tones to determine whether both left and right speakers are achieving proper stereo playback and separation between channels. Does distortion issue affect both speakers?	Yes	Go to step 8.		
		No	Go to step 10.		
8.	Remove LCD panel with glass. To troubleshoot this issue completely, a known-good (left or right) internal speaker is required. Do you have immediate access to a known-good speaker?	Yes	Go to step 9.		
		No	Replace logic board. Verify issue resolved.	M09	MLB
9.	Substitute a known-good speaker and retest. Is sound from known-good internal speaker audible, clear, and free of distortion?	Yes	Replace both of user's speakers. Verify issue resolved.	X09	OTHER ELECTRIC
		No	Reinstall user's speaker. Replace logic board. Verify issue resolved.	M09	MLB
10.	Inspect and carefully clean affected speaker cone using a soft tissue to remove dust, debris, or foreign material such as metal fragments that easily adhere to the magnetic speaker. Reseat speaker connection and retest. Is sound from affected speaker audible, clear, and free of distortion?	Yes	Issue resolved by cleaning the speaker membrane. Verify resolution.		
		No	Go to step 11.		
11.	To troubleshoot this issue completely, a known-good speaker is required. Do you have immediate access to a known-good speaker?	Yes	Go to step 12.		
		No	Replace affected speaker. Verify issue resolved.	X09	OTHER ELECTRIC
12.	Substitute a known-good speaker and retest. Is sound from affected speaker audible, clear, and free of distortion?	Yes	Replace user's affected speaker. Verify issue resolved.	X09	OTHER ELECTRIC
		No	Replace logic board. Reinstall user's speaker. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
13.	<p>Connect and disconnect external speakers/headphones, verifying that audio can be played from both external and internal speakers and that computer produces a clear, distortion-free sound.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): External Apple Bluetooth Peripherals

Unlikely causes:


Not relevant


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Apple Bluetooth keyboard, mouse, or trackpad won't pair with known-good computer• Apple Bluetooth device intermittently loses its connection• Data transfer with Apple Bluetooth device is too slow or times out• Apple Wireless Mouse or Magic Trackpad causes erratic cursor tracking <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check for and apply latest software and firmware updates.2. In System Preferences make sure Bluetooth is on and set to Discoverable.3. If the device does not power on, install new or freshly charged batteries.4. Attempt to pair user's Bluetooth device with a known-good computer, using Apple Support article TS3048: Troubleshooting wireless mouse and keyboard issues.5. Reset Bluetooth device or delete pairing (if applicable).6. If Bluetooth pairs normally at your service location, research potential sources of interference in the user's environment, such as microwave ovens or cordless phones in the 2.4/5GHz range. See Apple Support article HT1365: AirPort and Bluetooth: Potential sources of wireless interference.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Confirm that device is one of the following: <ul style="list-style-type: none">• Apple Magic Mouse (Late 2009) and newer• Apple Wireless Keyboard (Late 2009) and newer• Apple Magic Trackpad	Yes	Go to step 2.		
		No	Advise user to consult Apple Support article TS3048: Troubleshooting wireless mouse and keyboard issues , or for 3rd-party devices, contact manufacturer for support, software/firmware updates, or service options.		
	Is Bluetooth device one of these models?				

	Check	Result	Action	Code	Commodity
2.	<p>Test device with latest version of Bluetooth Diagnostics Utility. If a fault is detected, record the Diagnostic Receipt Code.</p> <p>Does device pass all Bluetooth Diagnostics Utility tests?</p>		 <p>ESCALATION REQUIRED.</p> <p>Bluetooth device appears to be performing to specifications. There may be an issue with user's computer, or Bluetooth interference in user's environment.</p> <p>If the issue persists, contact TSPS for additional support. Click Help button in GSX toolbar and then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		Yes			
		No	Go to step 3.		
3.	<p>Bluetooth Diagnostics Utility can verify communication to an Apple Wireless Keyboard, Magic Mouse, or Magic Trackpad. Identify wireless device being tested.</p> <p>Is the device being tested an Apple Wireless Keyboard or a Magic Mouse/Trackpad?</p>	Apple Wireless Keyboard	Go to step 4.		
		Apple Magic Mouse/Trackpad	Go to step 5.		
4.	<p>Refer to Apple Support article OP52: Bluetooth Keyboard, Mouse and Magic Trackpad Screening Process and specify fault reported by the Bluetooth Diagnostics Utility.</p> <p>Which symptom describes the fault?</p>	Device Loses Connection	Replace Apple Wireless Keyboard. Enter Diagnostic Receipt Code as required. Verify issue resolved.	K08	KEYBOARD
		Device Can't Pair	Replace Apple Wireless Keyboard. Enter Diagnostic Receipt Code as required. Verify issue resolved.	K07	KEYBOARD
5.	<p>Refer to Apple Support article OP52: Bluetooth Keyboard, Mouse and Magic Trackpad Screening Process and specify fault reported by Bluetooth Diagnostics Utility.</p> <p>Which symptom describes fault?</p>	Device Loses Connection	Replace Bluetooth device. Enter Diagnostic Receipt Code as required. Verify issue resolved.	K08	MOUSE
		Device Can't Pair	Replace Bluetooth device. Enter Diagnostic Receipt Code as required. Verify issue resolved.	K07	MOUSE

	Check	Result	Action	Code	Commodity
6.	Pair replacement Bluetooth device with a known-good computer. Verify that device sustains a connection for several minutes without error. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): External Apple Wired Keyboard and Mouse

Unlikely causes:

Not relevant


Quick Check

Symptoms	Quick Check
<p>Apple wired USB keyboard or mouse does not function with user's computer, or shows one or more of the following symptoms:</p> <ul style="list-style-type: none">• Mouse button(s) does not click• Mouse scroll ball does not operate smoothly• No mouse response• Keyboard keys stick• Keyboard keys loose or missing• One or more keys do not respond when pressed• No keyboard response at all• Apple wired mouse causes erratic cursor tracking• Apple wired keyboard or mouse is not recognized <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Try steps suggested in Apple Support articles HT1151: USB and FireWire Quick Assist and TS1986: My Apple USB mouse doesn't work.2. Disconnect all USB devices from user's computer except user's mouse or keyboard. Troubleshoot only one device at a time to help isolate issue.3. Unplug keyboard or mouse from USB port, wait a few seconds, and reconnect it.4. Connect keyboard or mouse to another USB port on user's computer.5. Make sure USB connectors are plugged in completely and correctly.6. Visually inspect USB connectors and ports for damage or debris.7. Try operating user's mouse on another surface. Ask user about type of surface usually being used with mouse. Glossy or transparent surfaces, or those with repetitive patterns, may cause mouse-tracking errors or faulty mouse operation. Explain that solid, non-reflective, opaque surfaces work best. Surface should be clean, but not shiny.8. Visually inspect user's keyboard or mouse for dirt, hair, liquid damage, or other debris. Check to see whether user has pets. Pet hair can lay across laser and cause intermittent mouse issues. Refer to Apple Support article HT3226: How to clean Apple products for information on cleaning user's keyboard or mouse.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect user's USB keyboard or mouse to a free USB port on a known-good computer to determine whether issue is related to USB port on user's computer, or to user's USB peripheral.	Yes	Go to "USB Port Not Recognized" troubleshooting flow.		
	Does user's keyboard or mouse function when used with a known-good computer?	No	Go to step 2.		

	Check	Result	Action	Code	Commodity
2.	<p>Visually inspect the user's USB mouse or keyboard to verify that attached USB cable and/or connector is not damaged or frayed.</p> <p>Check user's keyboard or mouse for physical and/or liquid damage.</p> <p>On mice, verify that all mouse buttons click and laser tracking LED illuminates.</p> <p>On keyboards, verify that all keyboard buttons are present and can be depressed normally.</p> <p>Does the user's USB mouse or keyboard, or its attached cable or connector, show signs of damage?</p>	Yes	Go to step 3.		
		No	Go to step 7.		
3.	<p>Isolate damage issue to either user's wired USB keyboard or mouse.</p> <p>Which peripheral is damaged?</p>	USB Mouse	<p>Replace USB mouse.</p> <p>Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K15	MOUSE
		USB Keyboard	Go to step 4.		
4.	<p>Closely examine user's keyboard to determine exact nature of the issue. Look for any signs of liquid spill, liquid penetration, or liquid damage to keyboard.</p> <p>Is damage to user's keyboard related to liquid spill?</p>	Yes	<p>Replace USB keyboard.</p> <p>Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K90	KEYBOARD
		No	Go to step 5.		
5.	<p>Click each key to ensure all keys are not sticking in the down or up position.</p> <p>Is damage to user's keyboard related to sticky keys or slow key response?</p>	Yes	<p>Replace USB keyboard.</p> <p>Verify issue resolved.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	K05	KEYBOARD
		No	Go to step 6.		

	Check	Result	Action	Code	Commodity
6.	Look for any loose or missing keycaps.	Yes	Replace USB keyboard. Verify issue resolved. Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K27	KEYBOARD
	Is damage to user's keyboard related to loose or missing keycaps?	No	Replace USB keyboard. Verify issue resolved. Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	K16	KEYBOARD
7.	Isolate failure issue to either user's wired USB keyboard or mouse.	USB Keyboard	Replace USB keyboard. Verify issue resolved.	K15	KEYBOARD
	Which peripheral is malfunctioning?	USB Mouse	Go to step 8.		
8.	Click and roll mouse's scroll ball to check that it rolls freely in all directions, with no physical resistance.	Yes	Replace USB mouse. Verify issue resolved.	K06	MOUSE
	Is issue related to the scroll ball?	No	Go to step 9.		
9.	Click mouse's various buttons to verify they click properly, without sticking, each time they are pressed.	Yes	Replace USB mouse. Verify issue resolved.	K14	MOUSE
	Is issue related to the mouse button(s)?	No	Replace USB mouse. Verify issue resolved.	K26	MOUSE
10.	Verify that user's USB keyboard or mouse continues to function properly with user's computer.	Yes	Issue resolved.		
	Is issue resolved?	No	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Microphone Issues

Unlikely causes:

Battery, camera, DisplayPort cable, fan, flash storage card/solid-state drive (SSD), hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card.


Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none">• Microphone not working.• Microphone audio garbled.• Line audio input functions properly. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. On user's computer go to System Preferences > Sound and verify the following:<ul style="list-style-type: none">◦ Input tab:<ul style="list-style-type: none">▪ "Internal microphone" source is available and selected.▪ Input volume slider is not set to zero.◦ Output tab:<ul style="list-style-type: none">▪ Sound output device is set to Internal Speakers.▪ Output volume is not muted or set to zero.2. Go to System Preferences > Sound > Input tab, and verify that "Input level" indicator moves when speaking into microphone.3. Launch QuickTime Player. Choose New Audio Recording from File menu. Choose Built-in Microphone from right pop-up menu, and adjust input volume using slider in center of window.4. Check that no cables are inserted into audio input or output jacks. Use an otoscope to visually inspect both jacks. Use compressed air to clean and remove any debris.5. Reset PRAM by holding down Command-Option-P-R keys while restarting until you hear the startup sound a second time.6. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Update or restore if needed.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up computer using restore partition or up-to-date, bootable OS X volume, and try to reproduce audio input issue using known-good audio sources and cables.	Yes	Go to step 2.		
	Does issue persist with a known-good OS?	No	Restore correct Mac OS X build. See Apple Support article HT1159: Mac OS X versions (builds) for computers . Verify resolution.		

	Check	Result	Action	Code	Commodity
2.	Connect a pair of headphones to audio-out port.	Yes	Microphone appears to be performing to specification. Verify issue resolved.		
	<p>Launch QuickTime Player and choose New Audio Recording from File menu.</p> <p>In the new recording window, choose Built-in Microphone from right pop-up menu. Adjust input volume using slider in center of window.</p> <p>Press red record button to start recording. Speak near microphone (top of display bezel, near camera) for several seconds, then click record button again to stop recording.</p> <p>Play recorded audio file using headphones to monitor quality of recording. If needed, press F11-F12 keys to adjust volume. Confirm that computer is able to record accurately from internal microphone input.</p> <p>Does computer accurately reproduce sound from internal microphone input?</p>	No	Go to step 3.		
3.	Connect an iPhone Headset with Microphone to the external headphone jack port.	Yes	Go to step 4.		
	<p>Launch QuickTime Player and choose New Audio Recording from File menu. Choose Built-In Microphone: External Microphone from the right pop-up menu. Adjust input volume using slider in center of window.</p> <p>Press red record button to start recording. Speak near microphone for several seconds, then click record button again to stop recording.</p> <p>Play recorded audio file using headphones to monitor quality of recording. If needed, press F11-F12 keys to adjust volume, and confirm that computer is able to record accurately from its built-in line-in input.</p> <p>Does computer accurately reproduce sound from external line input?</p>	No	Audio input issue is not limited to microphone input. Go to “Audio-In Jack Issues” troubleshooting flow.		

	Check	Result	Action	Code	Commodity
4.	Remove LCD panel with glass.	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
	Locate and disconnect camera/microphone/ALS cable from logic board and inspect cable for damage.	No	Go to step 5.		
	Is cable damaged?				
5.	Inspect camera/microphone/ALS cable connector port on logic board for damage.	Yes	Replace logic board. Verify issue resolved.	M24	MLB
	Is logic board connector damaged?	No	Go to step 6.		
6.	Reconnect camera/microphone/ALS cable to logic board.	Yes	Issue resolved by reseating camera/microphone/ALS cable. Verify resolution.		
	Retest recording.	No	Go to step 7.		
7.	Is recorded sound sample audible, clear, and free of distortion?	Yes	Go to step 8.		
	To troubleshoot this issue completely, a known-good camera/microphone/ALS cable is required.	No	Replace camera/microphone/ALS cable. Verify issue resolved.	X19	INTERNAL CABLE
8.	Do you have immediate access to a known-good camera/microphone/ALS cable?	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X19	INTERNAL CABLE
	Substitute a known-good camera/microphone/ALS cable to test with user's microphone assembly.	No	 <p>ESCALATION REQUIRED.</p> <p>Microphone is part of rear housing. Replace rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
	Retest recording.				
	Is recorded sound sample audible, clear, and free of distortion?				

	Check	Result	Action	Code	Commodity
9.	Verify that internal microphone is available and selected. Record a sound sample using GarageBand or QuickTime Player to verify quality of audio during playback. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): No Audio from Internal Speakers or Headphone Jack

Unlikely causes:



Battery, camera, camera/microphone/ALS cable, DisplayPort cable, fan, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, memory, power supply, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antennas, wireless card


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">No sound from internal speakers.No sound from left and/or right speaker channel.No sound from headphone jack. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Adjust volume controls to verify setting is above minimum, and audio is not muted.Test with known-good stereo sound file.Connect headphones or external speakers to external audio port. Verify in System Preferences > Sound > Output that Audio Out setting switches to Headphones, and whether audio can be played on external speakers.Disconnect any device connected to external audio port. In System Preferences > Sound > Output, check that sound output device reverts to Internal Speakers. Use Balance slider to isolate left and right speakers and check whether issue is limited to one speaker.Reset PRAM by holding down Command-Option-P-R keys while restarting until you hear the startup sound for the second time.Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.Check for and apply the latest software and firmware updates.Start up the computer using a known-good, up-to-date, bootable OS X volume and retest.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Start up computer using known-good, up-to-date, bootable OS X volume. Play the same known-good sound file and compare using internal speakers and known-good headphones or external speakers.	Yes	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and reinstall correct OS X build. Verify resolution.		
	Is sound now audible on both internal and external speakers?	No	Go to step 2.		
2.	Play known-good audio file on internal speakers, then connect known-good headphones or external speakers and check for presence of sound on external speakers.	Yes	Go to step 3.		
	Is sound issue limited to external headphones/speakers?	No	Go to step 6.		

	Check	Result	Action	Code	Commodity
3.	Disconnect headphones or external speakers. Remove LCD panel with glass. Inspect audio cable connector and its corresponding connector on logic board. Reseat connection and retest. Is internal/external sound now audible on both speakers?	Yes	Issue resolved by reseating audio cable. Verify resolution.		
		No	Go to step 4.		
4.	To troubleshoot this issue completely, a known-good rear enclosure is required. Do you have immediate access to a known-good rear enclosure?	Yes	Go to step 5.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
5.	Substitute a known-good rear enclosure with audio ports and retest. To do this, carefully place known-good rear enclosure near user's computer. Next, temporarily plug audio flex cable from known-good rear enclosure into audio connector on logic board inside user's computer. Is internal/external sound now audible on both speakers?	Yes	 <p>ESCALATION REQUIRED.</p> <p>Audio I/O ports are part of the rear housing. Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Replace logic board. Verify issue resolved.	M09	MLB

	Check	Result	Action	Code	Commodity
6.	Remove LCD panel with glass. Locate speaker connections on logic board. Inspect speaker cable connectors and corresponding connectors on logic board. Reseat connections and retest. Is sound now audible on both speakers?	Yes	Issue resolved by reseating speaker cable connections. Verify resolution.		
		No	Go to step 7.		
7.	Disconnect headphones or external speakers. In System Preferences > Sound > Output, move Balance slider all the way left then all the way right, testing sound output each time. Does missing audio issue affect both internal speakers?	Yes	Go to step 8.		
		No	Go to step 10.		
8.	Remove LCD panel with glass. To troubleshoot this issue completely, known-good (left and right) internal speakers are required. Do you have immediate access to known-good speakers?	Yes	Go to step 9.		
		No	Replace logic board. Verify issue resolved.	M09	MLB
9.	Substitute known-good speakers and retest. Is sound from known-good internal speakers audible?	Yes	Replace both user's speakers. Verify issue resolved.	X08	OTHER ELECTRIC
		No	Reinstall user's speakers. Replace logic board. Verify issue resolved.	M09	MLB
10.	To troubleshoot this issue completely, known-good speakers are required. Do you have immediate access to a known-good speaker?	Yes	Go to step 11.		
		No	Replace speakers. Verify issue resolved.	X08	OTHER ELECTRIC
11.	Substitute known-good speakers and retest. Is sound now audible on both speakers?	Yes	Replace user's speakers. Verify issue resolved.	X08	OTHER ELECTRIC
		No	Replace logic board. Reinstall user's speakers. Verify issue resolved.	M09	MLB
12.	Connect and disconnect external speakers/headphones, verifying that audio can be played from both external and internal speakers and that computer produces a clear, distortion-free sound. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2012): No Audio to External Display Speakers


Unlikely causes:


Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Sound cannot be enabled on speakers of an external Thunderbolt display, Mini DisplayPort display, or a compatible HDMI display using a compatible HDMI adapter with audio support <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Verify that nothing is connected to the headphone/audio output port on the user's computer, which would prevent audio from routing to speakers. In System Preferences > Sound > Output, select "Internal Speakers" then play audio file to verify it can be played on computer.Verify user's computer is using a known-good, compatible Thunderbolt display, Mini DisplayPort display, or HDMI display equipped with internal speaker(s), using a compatible Thunderbolt-to-HDMI adapter with audio support.Refer to following Apple Support articles for more information:<ul style="list-style-type: none">HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ)HT3382: Apple Mini DisplayPort adapters: Frequently asked questions (FAQ)If the user is connecting to another Mac in Target Display Mode, the sound from primary Mac should be playable on external display Mac's speakers. Refer to Apple Support article PH4469: OS X Lion: Use another Mac as a display for more information on how to do this.If the user is using an HDMI display such as an HDTV, sound from user's Mac should be playable on the HDTV's speakers. Refer to Apple Support article PH3776: OS X Lion: Use a television as a display for more information on how to do this.In System Preferences > Displays, verify that external display is detected and enabled.In System Preferences > Sound > Output, select the available Thunderbolt, DisplayPort, or HDMI Output device type, depending on display model and connection.In System Preferences > Sound > Output, adjust output volume and balance levels.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.Test audio output using more than one application or website.Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.With display connected to computer, check for and apply the latest software and firmware updates.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Connect a known-good display, display cable, and adapter (if needed) to a known-good similar-generation computer. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source.</p> <p>Can external display audio be enabled and play with known-good computer?</p>	Yes	Go to step 2.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
2.	<p>Connect known-good display, display cable, and adapter (if present) to user's computer. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source.</p> <p>Can external display audio be enabled and play with user's computer?</p>	Yes	Go to step 4.		
		No	Go to step 3.		
3.	<p>Start up user's computer using recovery partition or an up-to-date, bootable OS X volume. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source.</p> <p>Can external display audio be enabled and play when user's computer has a known-good OS?</p>	Yes	Reinstall OS X on user's computer. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Check for and apply latest software and firmware updates. Verify resolution.		
		No	Replace logic board. Verify issue resolved.	M09	MLB
4.	<p>Retest user's display, cable, and/or adapter one at a time to identify affected element. Check System Preferences > Sound > Output for an available Thunderbolt, DisplayPort, or HDMI Output device type. Select available device type, adjust output volume level, and play audio file/source.</p> <p>Can external display audio be enabled and play with user's computer?</p>	Yes	Issue resolved. Verify issue resolved.		
		No	Go to step 5.		
5.	<p>User's external display, cable and/or adapter appears to be causing the issue.</p> <p>What is the product brand?</p>	Apple display, cable, or adapter	Go to step 6.		
		Third party display, cable, or adapter	Refer user to contact product manufacturer for further compatibility, software requirements information, or service.		

	Check	Result	Action	Code	Commodity
6.	<p>Issue appears to be related to an Apple product. Specify the product type.</p> <p>What type of Apple product?</p>	Apple display	Return computer to user. Enter Apple display serial number into GSX, locate its service guide, and troubleshoot display using a known-good computer.	X03	EXTERNAL CABLE
		Apple cable or adapter	Check for possible accidental damage. Replace Apple cable or adapter. Verify issue resolved.	X03	EXTERNAL CABLE
7.	<p>Play a known-good audio file/source and verify that sound output to all speakers is audible.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

Thunderbolt Cable Connectivity Issues


Unlikely causes:

Not relevant

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Unable to access Thunderbolt peripherals.• Thunderbolt shows no connection.• Slow Thunderbolt performance. <p>Note: These symptoms address issues with the Thunderbolt cable, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on the 'Troubleshoot another issue' button to select a functional area and issue that addresses issues with computer's Thunderbolt port instead.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check manufacturer's minimum system requirements for connectivity to user's Thunderbolt peripheral. Refer to Apple Support article HT4614: About Thunderbolt to Thunderbolt cable (2 m).2. Check Thunderbolt presence in System Information. Complete following steps:<ul style="list-style-type: none">• Connect user's Thunderbolt cable to available Thunderbolt port on user's computer or known-good computer supporting Thunderbolt.• Connect opposite end of user's Thunderbolt cable to known-good Thunderbolt peripheral, such as:<ul style="list-style-type: none">◦ Known-good computer supporting Thunderbolt target disk mode◦ Apple Thunderbolt Display◦ Other known-good Thunderbolt peripheral• Power on connected equipment and start up user's computer.• Launch System Information. Verify computer's Thunderbolt port and cable connection status appear in System Information > Hardware > Thunderbolt. Link status should be: 2 (connected), not 7 (not connected).3. Reverse Thunderbolt cable. Connect other end of cable to user's computer. Repeat step 2 above to check for Thunderbolt presence.4. Disconnect user's Thunderbolt cable and reconnect to another available Thunderbolt port on user's computer (if available). Repeat step 2 to check for Thunderbolt presence.5. Substitute known-good Thunderbolt to Thunderbolt cable (2m). Repeat step 2 to check for Thunderbolt presence.6. Shut down user's computer, wait a few seconds, then restart it. Repeat step 2 to check for Thunderbolt presence.7. Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.8. Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time. Repeat step 2 to check for Thunderbolt presence.9. Check for and apply the latest software and firmware updates. Repeat step 2 to check for Thunderbolt presence.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Inspect both Thunderbolt cable connectors for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.</p> <p>Closely inspect cable for signs of damage, excessive wear, kinks, breaks, bends, knots, being wound too tight, etc.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 2.		
		No	Go to step 3.		
2.	<p>Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p> <p>Refer to Apple Support article OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Portables and Displays for pricing.</p> <p>Does user want to proceed with out-of-warranty repair?</p>	Yes	Replace Thunderbolt cable. Verify issue resolved.	X26	EXTERNAL CABLE
		No	Issue resolved. Return computer to user using correct positioning.		
3.	<p>Inspect user's Thunderbolt cable connectors connectors, and cable itself, for signs of excessive and/or unusual heat dissipation during operation.</p> <p>Perform this check only after cable has been connected to a powered computer port for at least 2 minutes.</p> <p>Did you find any signs of excessive heat in any part of the Thunderbolt cable or connector ends?</p>	Yes	Replace Thunderbolt cable. Verify issue resolved.	X85	EXTERNAL CABLE
		No	Replace Thunderbolt cable. Verify issue resolved.	X26	EXTERNAL CABLE
4.	<p>Verify connected Thunderbolt peripheral is recognized by computer when connected by user's Thunderbolt cable.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

Thunderbolt FireWire Adapter Connectivity Issues

Unlikely causes:

Not relevant


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">No FireWire port present.Unable to access FireWire resources.FireWire shows no connection.Slow FireWire performance. <p>Note: These symptoms address issues with the Thunderbolt FireWire Adapter, not the computer's Thunderbolt port. If you suspect an issue with the computer after attempting Quick Check steps that follow, please back up and click on 'Troubleshoot another issue' button to select a functional area and issue that addresses issue with computer's Thunderbolt port instead.</p> <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Launch System Information. Verify computer's FireWire port presence in System Information > Hardware > FireWire. Verify Thunderbolt FireWire Adapter presence in System Information > Hardware > Thunderbolt.Try known-good Thunderbolt FireWire Adapter, FireWire hardware and cable with user's computer.Using known-good Thunderbolt FireWire Adapter, FireWire hardware and cable, start up computer using Lion Recovery or an up-to-date, bootable OS X volume. Hold down Command (⌘) + R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery. Repeat step 1 above to check for Thunderbolt and FireWire presence.Verify bus-powered FireWire devices are receiving adequate power from computer.Check manufacturer's minimum system requirements for device. Refer to Apple Support article HT1151: USB and FireWire Quick Assist.Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.Check for and apply the latest software and firmware updates.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Inspect Thunderbolt FireWire Adapter connectors, cable, and body for dust, debris, damage, bent pins, or other indications of accidental damage. Use compressed air to remove debris.	Yes	Go to step 2.		
		No	Go to step 3.		
	Did you find any damaged components?				
2.	Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X26	EXTERNAL CABLE
	Refer to Apple Support article OP18: SERVICE: Accidental Damage Repair Pricing for Mail-In Portables and Displays for pricing.	No	Issue resolved. Return computer to user using correct positioning.		
	Does user want to proceed with out-of-warranty repair?				

	Check	Result	Action	Code	Commodity
3.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Start up computer completely and launch System Information.</p> <p>Verify FireWire port presence in System Information > Hardware > FireWire.</p> <p>Verify Thunderbolt FireWire Adapter presence in System Information > Hardware > Thunderbolt.</p> <p>Does user's Thunderbolt FireWire Adapter appear in both areas of System Information?</p>	Yes	Go to step 6.		
		No	Go to step 4.		
4.	<p>To troubleshoot this issue completely, a known-good Thunderbolt FireWire Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt FireWire Adapter?</p>	Yes	Go to step 5.		
		No	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
5.	<p>Substitute a known-good Thunderbolt FireWire Adapter.</p> <p>Repeat System Information presence checks from previous steps using user's computer.</p> <p>Does known-good Thunderbolt FireWire Adapter now appear in both areas of System Information?</p>	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
6.	<p>To continue troubleshooting this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> • FireWire 400/800 device, for example, hard drive or camera • FireWire 800 cable, or FireWire 800-to-400 adapter with FireWire cable <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 7.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

	Check	Result	Action	Code	Commodity
7.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Connect adapter's FireWire port to a known-good, bus-powered FireWire device with a known-good FireWire cable or adapter/cable combination.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does known-good FireWire device/cable combination mount to desktop or appropriate application?</p>	Yes	Go to step 10.		
		No	Go to step 8.		
8.	<p>To troubleshoot this issue completely, a known-good Thunderbolt FireWire Adapter is required.</p> <p>Do you have immediate access to a known-good Thunderbolt FireWire Adapter?</p>	Yes	Go to step 9.		
		No	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
9.	<p>Substitute a known-good Thunderbolt FireWire Adapter.</p> <p>Using same computer, cable, and external FireWire device, start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth.</p> <p>Does known-good FireWire device/cable combination now mount to desktop or appropriate application?</p>	Yes	Replace Thunderbolt FireWire Adapter. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
10.	<p>Connect user's Thunderbolt FireWire Adapter to an available Thunderbolt port on user's computer. Connect user's FireWire cable or adapter/cable combination to known-good FireWire device and user's Thunderbolt FireWire Adapter.</p> <p>Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device.</p> <p>Does known-good FireWire device mount to desktop with user's cable?</p>	Yes	Go to step 11.		
		No	Advise user to replace their FireWire adapter and/or FireWire cable set.		

	Check	Result	Action	Code	Commodity
11.	Connect user's FireWire device and cable or adapter/cable combination.	Yes	Issue resolved. Verify resolution.		
	Start up computer. Verify FireWire device mounts to desktop or is available in an application that supports the device, for example, iMovie, QuickTime, or Photo Booth. Does user's FireWire device/cable combination mount to desktop or appropriate application?	No	Review Apple Support article HT1151: USB and FireWire Quick Assist with user. Check manufacturer's minimum system requirements for device. Verify issue resolved.		
12.	Verify connected FireWire device is recognized by computer. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Thunderbolt Port Not Recognized

Unlikely causes:


Battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Computer does not recognize Thunderbolt devices. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Check for and apply latest software and firmware updates. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller.Check System Information > Hardware > Thunderbolt to verify that Thunderbolt hardware is recognized.Try using a known-good Thunderbolt cable. See Apple Support article HT4614: About Thunderbolt to Thunderbolt cable (2 m).Try using a known-good Thunderbolt device or a Thunderbolt-capable computer in target disk mode. Refer to PH10725: OS X Mountain Lion: Transfer files between two computers using target disk mode.Refer to Apple Support article HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ).Reset PRAM by holding down Command-Option-P-R keys while rebooting, until you hear the startup sound for the second time.Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller. Is proper OS X build installed?	Yes	Go to step 2.		
		No	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and reinstall correct OS X build and USB drivers for this computer model. Use Software Update to make sure newest revisions are installed. Verify issue resolved.		
2.	Apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as iMac with unique user ID (UID) and firmware version shown. Does System Information list Thunderbolt hardware?	Yes	Go to step 3.		
		No	Go to step 4.		

	Check	Result	Action	Code	Commodity
3.	Connect a known-good Thunderbolt device using a known-good Thunderbolt cable. Refresh System Information > Hardware > Thunderbolt. Thunderbolt port status should update, then show connected Thunderbolt device. Does System Information list connected Thunderbolt device?	Yes	Go to step 7.		
		No	Go to step 5.		
4.	Reset PRAM by holding down Command-Option-P-R keys while booting, until you hear startup sound for the second time. Does System Information list Thunderbolt hardware?	Yes	Go to step 3.		
		No	Go to step 5.		
5.	To troubleshoot this issue completely, a known-good logic board is required. Do you have immediate access to a known-good logic board?	Yes	Go to step 6.		
		No	Replace logic board. Verify issue resolved.	M33	MLB
6.	Substitute a known-good logic board and retest. Reset PRAM again and restart to desktop. Check System Information to verify Thunderbolt hardware. Does System Information list Thunderbolt hardware?	Yes	Replace logic board. Verify issue resolved.	M33	MLB
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
7.	Connect Thunderbolt cable from known-good Thunderbolt device to second Thunderbolt port. Wait for known good Thunderbolt device to mount. Refresh System Information > Hardware > Thunderbolt. Thunderbolt port status should update, then show connected Thunderbolt device. Does System Information list connected Thunderbolt device on second Thunderbolt port?	Yes	Issue resolved. Verify resolution.		
		No	Replace logic board. Verify issue resolved.	M33	MLB

	Check	Result	Action	Code	Commodity
8.	<p>Check System Information to confirm that Thunderbolt hardware is recognized and has a unique UID, most recent firmware version, and correct link status.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): USB Port Not Recognized

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Standard USB devices not recognized or not powered. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Disconnect all USB devices.Verify that user's USB device is compatible with computer. Refer to HT5172: Using USB 3 devices on Mac computers FAQ for more information about compatibility with various USB devices.Check to see whether user's USB device requires a specific driver to function properly.Check for and apply latest software and firmware updates.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.Check System Information > USB device tree to see whether computer recognizes internal USB devices (Bluetooth, IR, camera).Test each USB port using a known-good Apple wired keyboard or mouse.Verify that USB hubs being used have sufficient power.Start up using up-to-date, bootable OS X volume; then check System Information > USB device tree to see whether computer recognizes internal USB devices.Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and verify that correct version and build of OS X is installed.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Disconnect all USB devices. Verify whether known-good Apple wired keyboard or mouse functions correctly and is recognized in System Information > USB device tree.	Yes	Go to step 5.		
		No	Go to step 2.		
2.	Is known-good Apple USB device functional and recognized?				
	Continue to use known-good Apple wired keyboard or mouse. Start up computer using known-good, up-to-date, bootable OS X volume. Verify whether known-good USB device functions correctly and is recognized in System Information > USB device tree.	Yes	Go to step 4.		
	Is a known-good Apple USB device functional and recognized?	No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Inspect USB ports for lint, debris, or other foreign material. Remove debris with an anti-static brush.	Yes	Issue resolved. Return computer to user, explaining that debris in USB port caused issue and what to do to prevent contamination in the future.		
	Is known-good Apple USB device functional and recognized?	No	Replace logic board. Verify issue resolved.	M15	MLB
4.	Use Disk Utility to repair the file directory on internal hard drive. Restart and verify whether a known-good USB device functions correctly and is recognized in System Information > USB device tree.	Yes	Issue resolved by directory repair in Disk Utility. Verify resolution.		
	Is known-good Apple USB device functional and recognized?	No	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and restore USB drivers by reinstalling correct system build of OS X. Verify issue resolved.		
5.	This computer can support one high-powered USB device (e.g., iPad, iPhone, USB hard drive) at a time.	Yes	Go to step 6.		
	<p>Note: The first USB device to draw more than 900 mA is allotted up to 1100 mA, while all subsequent devices are limited to 500 mA. See Apple Support article HT4049: Apple Computers and Displays: Powering peripherals through USB for more information.</p> <p>Do you have immediate access to a known-good, high-powered USB device that draws over 900 mA?</p>	No	Go to step 8.		
6.	Connect known-good, high-powered USB device to one of the computer's USB ports. In System Information > USB device tree, "Current Available (mA)" and "Extra Operating Current (mA)" should each report 900 mA.	Yes	Go to step 7.		
	<p>Note: The first USB device to draw more than 900 mA is allotted up to 1100 mA, while all subsequent devices are limited to 900 mA. Verify that known-good USB device functions as expected.</p> <p>Does "Extra Operating Current" appear in System Information?</p>	No	Replace logic board. Verify issue resolved.	M38	MLB

	Check	Result	Action	Code	Commodity
7.	<p>Connect exact same high-powered USB device to next USB port. Make sure nothing is plugged into other port(s). Both “Current Available (mA)” and “Extra Operating Current (mA)” should each report 900 mA in System Information. Repeat action with every available USB port.</p> <p>Note: The first USB device to draw more than 900 mA is allotted up to 1100 mA, while all subsequent devices are limited to 900 mA. Verify USB device operates as expected.</p> <p>Does “Extra Operating Current” appear in System Information?</p>	Yes	Go to step 8.		
		No	Replace logic board. Verify issue resolved.	M38	MLB
8.	<p>Try user’s USB device with a known-good computer. Verify whether it functions normally and is recognized in System Information > USB device tree.</p> <p>Is user’s USB device functional and recognized?</p>	Yes	Issue resolved by testing USB ports and verifying user’s USB device. Verify resolution.		
		No	<p>Advise user to do the following:</p> <ul style="list-style-type: none"> • Contact USB device manufacturer for support. • Verify system requirements and Mac compatibility. • Find out whether device requires additional software. 		
9.	<ul style="list-style-type: none"> • Confirm that a known-good USB device is functional and recognized. • Check System Information for correct power allocation to USB device. <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): External USB ODD Noisy

Unlikely causes:


Not applicable

Quick Check

Symptoms	Quick Check
<p>Note: Be sure you understand what type of optical drive noise you should be concerned about and what noises you can safely ignore. The following lists help distinguish normal, functional optical drive sounds from noises that may indicate drive malfunction.</p> <p>Typical noises include sounds made during the following activities:</p> <ul style="list-style-type: none">• Waking computer from sleep• Burning a CD or DVD• Inserting a disc• Ejecting a disc• Importing (“ripping”) an audio CD in iTunes• Playing a DVD• Accessing an idle disc <p>Abnormal noises include the following:</p> <ul style="list-style-type: none">• Grinding• Loud, repeated clicking• Scraping sounds• Constantly seeking or cycling the eject mechanism with no disc inserted <p>Listen closely in a quiet environment for the following:</p> <ul style="list-style-type: none">• Noise during start up• Noise during operation• Noise when drive is copying or saving data <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify user's issue involves only abnormal sounds, as defined in symptoms.2. Verify Apple USB SuperDrive is sitting flat on a surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.3. Verify that optical drive is an Apple USB SuperDrive, which has a longer USB cable, and not a MacBook Air SuperDrive, which has a slightly shorter cable that may not reach iMac's USB ports while sitting on a flat surface alongside the iMac.4. Compare optical drive noise to a known-good equivalent Apple USB SuperDrive. Use sound samples in Apple Support article HT1723: Mac notebooks with optical drives: Noises from the optical drive to compare.5. Verify noise issue does not involve waking computer. When starting up or waking from sleep, Apple USB SuperDrive may make unfamiliar noises. Refer to Apple Support article TS2224: Mac notebooks: Noise when powering on or waking from sleep is normal.6. Test user's optical disc in a known-good drive to rule out a media issue. Verify disc size and shape are within specification in Apple Support article HT2801: Apple Computers: Troubleshooting the slot-loading SuperDrive.7. Test Apple USB SuperDrive with known-good discs. Verify media is free to spin without scraping edge or surface of media.8. Verify noise during seek activity is excessive. Seek noise should subside once disc is mounted.9. Verify disc spin noise is excessive. Disc spin should cease 30 seconds after mounting disc in Finder.10. Inspect Apple USB SuperDrive drive slot for obstructions (stuck disc, etc.)11. Inspect Apple USB SuperDrive USB cable and USB connector for damage.12. Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012), MacBook Air, and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper operation of drive. Verify user's configuration is supported.13. Apple USB SuperDrive must be plugged directly into computer's USB port, and cannot be used while connected to a USB hub.14. Leave Apple USB SuperDrive connected to user's computer and restart computer while pressing mouse button or keyboard Eject key to cycle optical drive.15. If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting up computer with Apple USB SuperDrive already plugged in.16. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check whether Apple USB SuperDrive is constantly seeking or cycling eject mechanism with no optical disc inserted. Optical drive should perform only one reset sequence and then rest idly, ready for media.	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL
	Does optical drive spin, seek, and/or reset continuously without an optical disc inserted?	No	Go to step 2.		
2.	Closely inspect user's Apple USB SuperDrive to determine whether a disc or other debris is stuck inside.	Yes	Go to step 3.		
	Is a disc or other debris stuck in drive?	No	Go to step 4.		
3.	Refer to Apple Support article RP451: Apple USB SuperDrive to open drive enclosure and remove any stuck disc, dust, debris, or other foreign materials.	Yes	Issue resolved by removing stuck disc or debris from drive. Verify resolution.		
	Retest Apple USB SuperDrive by inserting, mounting and ejecting a known-good optical disc.	No	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
4.	Is optical drive function fully restored?				
	Insert known-good optical disc, then eject disc. Listen carefully to Apple USB SuperDrive disc handling. Eject noise should consist of a pop as disc is released from motor hub, then gear movement as motor pushes disc out of slot. Repeat test several times.	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL
5.	Is disc eject noise abnormal and excessive over multiple trials?	No	Go to step 5.		
	Disconnect Apple USB SuperDrive and retest for computer noise.	Yes	Go to step 6.		
6.	Has noise been eliminated?	No	Go to "Noise / Hum / Vibration" troubleshooting flow.		
	To troubleshoot this issue completely, you will need an identical, known-good Apple USB SuperDrive with which to compare optical drive sounds.	Yes	Go to step 7.		
7.	Do you have immediate access to a known-good Apple USB SuperDrive?	No	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL
	Substitute a known-good Apple USB SuperDrive and retest.	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J04	OPTICAL
8.	Has noise been eliminated?	No	Go to "Noise / Hum / Vibration" troubleshooting flow.		

	Check	Result	Action	Code	Commodity
8.	Verify Apple USB SuperDrive does not make any abnormal noises. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): External USB ODD Not Recognized


Unlikely causes:

Not applicable

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Discs cannot be inserted.Discs can be inserted, but are ejected immediately.Discs can be inserted, but are ejected after drive has spun up for a few seconds.Discs can be inserted and ejected, but do not appear in Finder. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Go to Finder Preferences > General and make sure “CDs, DVDs, and iPods” is checked under “Show these items on the desktop.”Make sure Apple USB SuperDrive is sitting flat on a surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.Verify that optical drive is an Apple USB SuperDrive, which has a longer USB cable, and not a MacBook Air SuperDrive, which has a slightly shorter cable that may not reach iMac's USB ports while sitting on a flat surface alongside the iMac.Inspect Apple USB SuperDrive drive slot for obstructions, such as a stuck disc.Inspect Apple USB SuperDrive cable and USB connector for damage.The Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012), MacBook Air, and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper operation of drive. Verify user's configuration is supported.Apple USB SuperDrive must be plugged directly into computer's USB port and cannot be used while connected to a USB hub.Leave Apple USB SuperDrive connected to user's computer and restart computer while pressing mouse button or keyboard Eject key to cycle optical drive.If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting computer with Apple USB SuperDrive already plugged in.Refer to Apple Support article HT2801: Troubleshooting the slot-loading SuperDrive.Connect Apple USB SuperDrive to known-good iMac, MacBook Pro (Retina, Mid 2012), MacBook Air, or Mac mini (Early 2009 or later) to verify drive's functionality separately from user's computer.Disconnect user's Apple USB SuperDrive and connect a known-good Apple USB SuperDrive to same USB port on user's computer to verify computer's functionality separately from user's drive. If issue persists, troubleshoot as a faulty USB port on user's computer.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Connect user's Apple USB SuperDrive to an available USB port on user's computer and start up computer. Check System Information > Hardware > USB to verify presence of optical drive.</p> <p>Repeat this process using each USB port on user's computer to verify all of computer's USB ports are functioning.</p> <p>Does drive appear in System Information when connected to every USB port?</p>	Yes	Go to step 2.		
		No	Go to "USB Port Not Recognized" troubleshooting flow.		
2.	<p>Attempt to insert a known-good, properly formatted CD or DVD disc into Apple USB SuperDrive. Check whether disc auto-ejects either immediately or within a few seconds after drive has spun up.</p> <p>Does disc auto-eject shortly after insertion?</p>	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
		No	Go to step 3.		
3.	<p>After insertion, verify disc spins and disc volume mounts in Finder.</p> <p>Does drive mount known-good disc?</p>	Yes	Go to step 4.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J09	OPTICAL
4.	<p>Check to see whether Apple USB SuperDrive properly mounts then reads both known-good CD and DVD media.</p> <p>If only one type of media is recognized, there may be a laser issue.</p> <p>Can drive read both media types?</p>	Yes	Issue resolved.		
		No	Go to "Mass Storage: External USB ODD Read/Write or Performance Issues" troubleshooting flow.		
5.	<p>Insert, mount, and eject both a known-good CD and known-good DVD.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	J99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): External USB ODD Read-Write or Performance Issues

Unlikely causes:


Not applicable

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Errors when writing to optical media• Errors when reading from optical media• Hangs when accessing or writing data• Read or write speeds slower than expected <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Test user's optical media in known-good Apple USB SuperDrive connected to known-good computer.2. Test known-good, compatible optical media in user's Apple USB SuperDrive connected to a known-good computer.3. Go to System Information > Hardware > Disc Burning to compare actual disc burning specifications to user's expectations.4. See Apple Support articles HT2543: About optical disc drive burning and write speeds and HT2882: Factors that affect writing to or reading from optical media to learn more about disc burning and how performance is affected by write speeds, media types, and software.5. Make sure Apple USB SuperDrive is sitting flat on a surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.6. Verify that the optical drive is actually an Apple USB SuperDrive, which has a longer USB cable, and not a MacBook Air SuperDrive, which has a slightly shorter cable that may not reach iMac's USB ports while sitting on a flat surface alongside iMac.7. Inspect Apple USB SuperDrive slot for obstructions (stuck disc, etc.)8. Inspect Apple USB SuperDrive USB cable and USB connector for damage.9. The Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012), MacBook Air, and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper drive operation. Verify user's configuration is supported.10. The Apple USB SuperDrive must be directly plugged into computer's USB port and cannot be used while connected to a USB hub.11. With Apple USB SuperDrive connected to user's computer, restart computer while pressing mouse button or Eject key to cycle optical drive.12. If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting computer with Apple USB SuperDrive already plugged in.13. Refer to Apple Support article HT2801: Troubleshooting the slot-loading SuperDrive.14. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect user's Apple USB SuperDrive to user's computer and start up computer. Insert media into Apple USB SuperDrive and listen for scraping or scratching noises as disc spins up. Eject disc and examine surface and edges for scrapes or scratches. Verify disc spins freely without optical drive scraping edge or surface. Does media spin freely in drive?	Yes	Go to step 2.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
2.	Closely inspect user's Apple USB SuperDrive to determine whether disc or debris is stuck inside. Is disc or debris stuck in drive?	Yes	Go to step 3.		
		No	Go to step 4.		
3.	Refer to Apple Support article RP451: Apple USB SuperDrive to open drive enclosure and remove any stuck disc, dust, debris, or other foreign materials. Retest Apple USB SuperDrive by inserting, mounting and ejecting a known-good optical disc. Is optical drive function fully restored?	Yes	Issue resolved by removing stuck disc or debris from drive. Verify resolution.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
4.	Verify optical drive can properly read known-good CDs. Can optical drive read CDs?	Yes	Go to step 5.		
		No	Go to step 6.		
5.	Verify optical drive can properly read known-good DVDs. Can optical drive read DVDs?	Yes	Go to step 7.		
		No	Go to step 6.		
6.	Check System Information > Hardware > USB to verify presence of optical drive. Does optical drive appear in System Information?	Yes	Go to step 7.		
		No	Go to "Mass Storage: External USB ODD Not Recognized" troubleshooting flow.		
7.	Burn test data to CD and DVD media compatible with Apple USB SuperDrive. Verify burned media is recognized and readable by drive. Can optical drive read its own burned media?	Yes	Go to step 8.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J03	OPTICAL
8.	To troubleshoot this issue completely, you will need an identical, known-good Apple USB SuperDrive with which to compare optical disc read and burn times. Do you have immediate access to a known-good Apple USB SuperDrive?	Yes	Go to step 9.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J07	OPTICAL

	Check	Result	Action	Code	Commodity
9.	<p>Check read and burn times of user's Apple USB SuperDrive connected to a known-good computer. Using same media type and brand, compare these times against a known-good Apple USB SuperDrive connected to same computer.</p> <p>Does user's drive have significantly longer read or burn times than known-good drive?</p>	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J07	OPTICAL
		No	Issue resolved.		
10.	<p>Test all Apple USB SuperDrive functions and drive performance to verify a successful repair.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	J99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): External USB ODD Rejects, Does Not Accept, or Does Not Eject Media

Unlikely causes:

Not applicable


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Cannot insert a disc into drive.• Cannot eject a disc from drive.• Drive ejects discs immediately after insertion. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify Apple USB SuperDrive is on flat surface with silver top facing upward. Do not attempt to operate SuperDrive on its side or upside-down.2. Verify that optical drive is actually an Apple USB SuperDrive, which has a longer USB cable, and not a MacBook Air SuperDrive, which has a slightly shorter cable that may not reach iMac's USB ports while sitting on a flat surface alongside the computer.3. Inspect optical drive slot for obstructions (stuck disc, for example).4. Inspect Apple USB SuperDrive USB cable and connector for damage.5. Apple USB SuperDrive is designed exclusively for use with iMac, MacBook Pro (Retina, Mid 2012), MacBook Air and Mac mini (Early 2009 or later). USB ports on other computers may not provide sufficient power to enable proper operation of drive. Verify user's configuration is supported.6. Apple USB SuperDrive must be directly plugged into computer's USB port, and cannot be used while connected to a USB hub.7. Leave Apple USB SuperDrive connected to user's computer and restart computer while pressing mouse button or keyboard Eject key to cycle optical drive.8. If user is experiencing an issue using Apple USB SuperDrive with Microsoft Windows, try starting computer with Apple USB SuperDrive already plugged in.9. Refer to Apple Support article HT2801: Apple Computers: Troubleshooting the slot-loading SuperDrive10. Connect user's Apple USB SuperDrive to a known-good computer and attempt to use it, to verify drive's functionality separately from user's computer.11. Connect a known-good Apple USB SuperDrive to user's computer. Attempt to use drive to verify computer's functionality separately from user's Apple USB SuperDrive.12. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Connect user's Apple USB SuperDrive to an available USB port on user's computer and start up computer. Check System Information > Hardware > USB to verify presence of optical drive.	Yes	Go to step 2.		
	Does optical drive appear in System Information?	No	Go to "External USB ODD Not Recognized" troubleshooting flow.		

	Check	Result	Action	Code	Commodity
2.	Closely inspect user's Apple USB SuperDrive to determine whether a disc or other debris is stuck inside. Is a disc or other debris stuck in drive?	Yes	Go to step 3.		
		No	Go to step 4.		
3.	Refer to Apple Support article RP451: Apple USB SuperDrive to open drive enclosure and remove any stuck disc, dust, debris, or other foreign materials. Retest Apple USB SuperDrive by inserting, mounting, and ejecting a known-good optical disc. Is optical drive function fully restored?	Yes	Issue resolved by removing stuck disc or debris from drive. Verify resolution.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J02	OPTICAL
4.	Verify known-good disc can fit through enclosure slot. Is clearance in enclosure slot sufficient for disc insertion?	Yes	Go to step 7.		
		No	Go to step 5.		
5.	Closely inspect entire Apple USB SuperDrive enclosure for dents, scratches, or other indications of impact or abuse. Is insufficient clearance due to accidental damage?	Yes	Go to step 6.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
6.	Inform user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options. Does user want to proceed with out-of-warranty repair?	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J05	OPTICAL
		No	Issue resolved. Using proper positioning, return computer to user.		
7.	Inspect slot on optical drive assembly for proper disc clearance. Is clearance in optical drive slot sufficient for disc insertion?	Yes	Go to step 12.		
		No	Go to step 8.		
8.	When a CD or DVD pops off spindle inside an optical drive (usually due to impact to drive) and remains in drive mechanism, the loose disc prevents slot from opening fully, creating a closed condition. Inspect slot in optical drive to determine whether it is closed or not accepting discs. If disc slot is closed, inspect drive mechanism, especially drive enclosure, for evidence of drop damage. Note: If disc slot is closed, but there is no sign of accidental damage, choose "NO" to the question below. Is disc slot access closed due to accidental damage?	Yes	Go to step 6.		
		No	Go to step 9.		

	Check	Result	Action	Code	Commodity
9.	Inspect slot in Apple USB SuperDrive to determine if it is closed or not accepting discs because of a stuck disc. Is disc slot access closed because of a stuck disc?	Yes	Go to step 3.		
		No	Go to step 10.		
10.	Make sure optical drive assembly is mounted into enclosure correctly and is properly aligned with enclosure slot opening. Is drive assembly properly aligned with enclosure slot opening?	Yes	Go to step 12.		
		No	Go to step 11.		
11.	Refer to Apple Support article RP451: Apple USB SuperDrive to open drive enclosure and align optical drive assembly with enclosure's bezel slot.	Yes	Issue resolved. Apple USB SuperDrive alignment realigned disc inject function. Verify issue resolved.		
	Retest Apple USB SuperDrive by inserting, mounting, and ejecting a known-good optical disc.	No	Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
	Is optical drive function fully restored?				
12.	Attempt to insert a known-good, properly formatted CD or DVD into Apple USB SuperDrive. Check whether disc auto-ejects either immediately or within a few seconds after drive has spun up. Does disc immediately auto-eject?	Yes	Replace Apple USB SuperDrive. Verify issue resolved.	J01	OPTICAL
		No	Go to step 13.		
13.	After insertion, check if disc spins and disc volume mounts in Finder. Does disc volume mount?	Yes	Go to step 14.		
		No	Go to "External USB ODD Read/Write or Performance Issues" troubleshooting flow.		
14.	Eject disc by dragging disc icon to Trash or selecting disc icon and pressing Eject key or Command-E on keyboard.	Yes	Issue resolved.		
		No	Replace Apple USB SuperDrive. Verify issue resolved.	J02	OPTICAL
	Does disc eject properly?				
15.	Insert, mount, and eject a known-good optical disc. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple.</p>	J99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): HDD Noisy

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, WiFi/Bluetooth antenna(s), wireless card



Quick Check

Symptoms	Quick Check
<p>Note: Be sure you understand what type of hard drive noise you should be concerned about, and what noises you can safely ignore. The following descriptions help distinguish normal, functional hard drive sounds from noises that may indicate drive malfunction.</p> <p>Noises such as occasional quiet chirping or beeping are typically normal hard drive sounds.</p> <p>Refer to Apple Support article TS3204: iMac: Evaluating normal noises to determine whether noise is within expected range.</p> <p>Abnormal noises such as grinding or loud, repeated clicking or scraping sounds may be indications of a more serious issue.</p> <p>Listen closely in a quiet environment for the following:</p> <ul style="list-style-type: none">Noise during start upNoise during operationNoise when drive copies or saves data <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>Important: Always ask whether the user's data has been backed up prior to repair.</p> <ol style="list-style-type: none">Verify that user's issue involves only abnormal sounds, as defined in symptoms.Compare hard drive noise to a known-good equivalent computer. Refer to Apple Support article TS3204: iMac: Evaluating normal noises to determine if noise is within expected range.Check for and apply latest software and firmware updates.If the computer model is internally equipped with both a hard drive and a solid state drive (SSD), refer to Apple Support article HT5446: About Fusion Drive for specific troubleshooting and restore process.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Use OS X Recovery to troubleshoot potential software issues and to verify hard drive presence. Hold down Command-R during startup to restart from recovery partition. Launch Disk Utility.	Yes	Go to step 2.		
	See Apple Support article HT4718: OS X: About OS X Recovery for more information.	No	Go to "Hard Drive/SSD/Flash Storage Not Mounting / Not Recognized / Read-Write Issues" troubleshooting flow.		
	Does hard drive appear in Disk Utility?				
2.	Verify that hard drive S.M.A.R.T. status in Disk Utility shows as Verified. Is S.M.A.R.T. status Verified?	Yes	Go to step 3.		
		No	Go to "Hard Drive/SSD/Flash Storage Not Mounting / Not Recognized / Read-Write Issues" troubleshooting flow.		

	Check	Result	Action	Code	Commodity
3.	Use Disk Utility to repair hard disk directory.	Yes	Go to step 5.		
	Did Disk Utility repair directory or finish without error?	No	Go to step 4.		
4.	Consult Apple Support article HT1159: Mac OS X versions (builds) for computers to determine correct version and build of OS X for this iMac; then erase and reinstall.	Yes	Go to step 5.		
	Important: Always ask whether user's data has been backed up prior to repair. Did installation successfully finish and, did computer start up to the desktop?	No	Go to "Hard Drive/SSD/Flash Storage Not Mounting / Not Recognized / Read-Write Issues" troubleshooting flow.		
5.	Restart computer and listen closely for abnormal noise.	Yes	Go to step 10.		
	Has abnormal noise been eliminated?	No	Go to step 6.		
6.	Disconnect internal hard drive and start up from a known-good, up-to-date, bootable Mac OS X volume.	Yes	Go to step 7.		
	Has noise been eliminated?	No	Go to "Noise / Hum / Vibration" troubleshooting flow.		
7.	To confirm that drive is mounted properly, remove hard drive and verify the following:	Yes	Go to step 8.		
	<ul style="list-style-type: none"> Rubber vibration isolation bumper is properly installed around hard drive, and does not appear worn, cracked, out-of-position, or otherwise damaged. Hard drive bracket is securely positioned over hard drive, is fastened to rear enclosure with appropriate screws, and does not appear loose, bent, or otherwise damaged. Any other internal components that were loosened during take-apart process have been re-tightened. For example, power supply or speaker screws may need to be loosened to gain access to hard drive bracket. After this is done, these components must be re-tightened to ensure they do not cause noise due to loose components vibrating against other parts, or against enclosure, especially around the chin area. Are hard drive mounting components undamaged and installed properly?	No	Replace missing or damaged components: <ul style="list-style-type: none"> Hard drive bracket Rubber vibration isolation bumper 	X13	PIECE PART
8.	To troubleshoot this issue completely, a known-good hard drive is required.	Yes	Go to step 9.		
	Do you have immediate access to a known-good hard drive?	No	Replace hard drive. Verify issue resolved.	H06	HDD

	Check	Result	Action	Code	Commodity
9.	Substitute a known-good hard drive and retest. Has noise been eliminated?	Yes	Replace hard drive. Verify issue resolved.	H06	HDD
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	
10.	Confirm that computer no longer makes any abnormal noises. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): HDD/SSD/Flash Storage Not Recognized / Not Mounting / Read–Write Issues

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check



Symptoms	Quick Check
<ul style="list-style-type: none">Boots to gray screenBoots to blue screenDisplays flashing folder with question mark or prohibitive symbolCannot save documentsDisplays read/write error message(s)Hangs when accessing or saving data <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>Important: Always ask whether user's data has been backed up prior to repair.</p> <ol style="list-style-type: none">Disconnect all peripherals and attempt to start up computer.To restore default startup disk, reset PRAM by holding down Command-Option-P-R keys while starting up, until you hear startup sound for the second time.Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).If the computer is internally equipped with both a hard disk drive (HDD) and a solid state drive (SSD)/flash storage, refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012 and Later): About Fusion Drive for specific troubleshooting and restore processes.


Deep Dive


	Check	Result	Action	Code	Commodity
1.	Start up from known-good original system media or up-to-date, bootable OS X volume.	Yes	Go to step 2.		
	Confirm that computer completes the startup process: chime > gray screen > Apple logo > spinning gear > login screen > desktop or installer screen.	No	Go to "Will Not Start Up" troubleshooting flow.		
	Does computer complete the startup process?				


	Check	Result	Action	Code	Commodity
2.	Run AST Storage Diagnostic on the user's computer and examine the results of the test. Do all internal drive tests pass in Storage Diagnostic?		 ESCALATION REQUIRED.	H99	
		Yes	Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.		
		No	Go to step 3.		
3.	Examine Storage Diagnostic results for presence of an internal drive. Did drive presence test PASS or FAIL?	Pass	Go to step 4.		
		Fail	Go to step 16.		
4.	Examine Storage Diagnostic results for SMART status. Did SMART test PASS or FAIL?	Pass	Go to step 5.		
		Fail	Go to step 9.		
5.	Examine Storage Diagnostic results for Short Random Multi-Block Read Test. Did Short Random Multi-Block Read Test PASS or FAIL?	Pass	Go to step 6.		
		Fail	Go to step 16.		
6.	Examine Storage Diagnostic results for File System Check. Did File System Check PASS or FAIL?	Pass	Go to step 7.		
		Fail	Go to step 10.		
7.	Examine Storage Diagnostic results for Bootable Volume Presence Check. Did Bootable Volume Check PASS or FAIL?	Pass	Go to step 8.		
		Fail	Go to step 10.		
8.	Examine Storage Diagnostic results for Last OS Reinstall Check. Did Last OS Reinstall Check PASS or FAIL?		 ESCALATION REQUIRED.	H99	
		Pass	Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.		
		Fail	Go to step 10.		

	Check	Result	Action	Code	Commodity
9.	Identify the type of storage device affected: <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage / solid-state drive (SSD) Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Verify issue resolved.	H05	HDD
		SSD	Replace the user's flash storage / SSD. Verify issue resolved.	H05	SSD
10.	Restart while holding down the Command-R keys to start up from the recovery partition. Does computer start up from recovery tools partition?	Yes	Go to step 12.		
		No	Go to step 11.		
11.	If OS X is present but not able to restart from the recovery partition, or the partition is missing, consult Apple Support article HT4848: About Recovery Disk Assistant to restore the partition. Restart from the new recovery partition, holding down Command-R during restart. Does computer start up from newly created recovery tools partition?	Yes	Go to step 12.		
		No	Go to step 16.		
12.	In Disk Utility, select the Partition tab, then click the Option button to verify that the partition table is correctly set to GUID. Try to repair the partition using Disk Utility. Does Disk Utility successfully repair the partition?	Yes	Go to step 15.		
		No	Go to step 13.		
13.	Connect the computer to a network with Internet access. Press Command-Option-R keys to start up the computer into the Internet recovery partition. Open Disk Utility and refer to instructions in Apple Support article TS4482: Partition a problematic drive two times before recommending service or replacement to re-partition the internal hard drive. This will force a rewrite of the partition table. Does Disk Utility successfully partition the drive without any errors?	Yes	Go to step 14.		
		No	Go to step 16.		

	Check	Result	Action	Code	Commodity
14.	<p>Quit Disk Utility and restore OS X software from Internet. Refer to Apple Support article HT4718: About OS X Recovery for OS X recovery options and requirements.</p> <p>Does computer complete the start up process?</p>	Yes	Go to step 15.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	
15.	<p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Issue resolved. Verify resolution.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	
16.	<p>Attempt to isolate which mass storage component is involved with this issue:</p> <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage/solid state drive (SSD) <p>Is this an HDD or SSD Issue?</p>	HDD	Go to step 17.		
		SSD	Go to step 23.		
17.	<p>Disconnect and inspect hard drive cable. Look for damage on logic board connector and cable.</p> <p>Check for damaged or corroded cable connector and missing or bent pins on logic board connector.</p> <p>Did you find damage to hard drive cable or logic board connectors?</p>	Yes	Go to step 18.		
		No	Go to step 19.		

	Check	Result	Action	Code	Commodity
18.	<p>Damage to multiple parts requires an escalation to Apple TSPS for repair approval.</p> <p>Is damage limited to hard drive cable?</p>	Yes	Replace hard drive cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	P99	
19.	<p>Reconnect the hard drive cable to the logic board.</p> <p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Issue resolved by reseating hard drive cable. Verify issue resolved.		
		No	Go to step 20.		
20.	<p>To troubleshoot this issue completely, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Hard drive • Hard drive cable <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 21.		
		No	Replace hard drive. Verify issue resolved.	H01	HDD
21.	<p>Substitute a known-good hard drive cable to test with user's hard drive.</p> <p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Replace hard drive cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 22.		
22.	<p>Continue to use known-good hard drive cable and substitute a known-good hard drive.</p> <p>Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.</p> <p>Do all internal drive tests pass in Storage Diagnostic?</p>	Yes	Replace hard drive. Reinstall user's hard drive cable. Verify issue resolved.	H01	HDD
		No	Replace logic board. Reinstall user's hard drive and cable. Verify issue resolved.	M19	MLB

	Check	Result	Action	Code	Commodity
23.	Disconnect and inspect SSD/flash storage. Look for damage on logic board connector and SSD/flash storage.	Yes	Go to step 24.		
	Check for damaged or corroded card edge connectors and missing or bent pins on logic board connector.	No	Go to step 25.		
	Did you find damage to SSD/flash storage or logic board connectors?				
24.	Damage to multiple parts requires an escalation to Apple TSPS for repair approval. Is damage limited to SSD card or flash storage?	Yes	Replace SSD/flash storage. Verify issue resolved.	H01	SSD
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	P99	
25.	Reconnect SSD or flash storage to logic board.	Yes	Issue resolved by reseating SSD/flash storage. Verify issue resolved.		
	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.	No	Go to step 26.		
	Do all internal drive tests pass in Storage Diagnostic?				
26.	To troubleshoot this issue completely, a known-good SSD or flash storage is required.	Yes	Go to step 27.		
	Do you have immediate access to known-good SSD/flash storage?	No	Replace SSD/flash storage. Verify issue resolved.	H01	SSD
27.	Substitute a known-good SSD or flash storage.	Yes	Replace SSD/flash storage. Verify issue resolved.	H01	SSD
	Run AST Storage Diagnostic on the user's computer again, and examine the results of the test.	No	Replace logic board. Reinstall the user's SSD/flash storage. Verify issue resolved.	M19	MLB
	Do all internal drive tests pass in Storage Diagnostic?				

	Check	Result	Action	Code	Commodity
28.	<p>Confirm that the computer can successfully start up from the internal hard drive/SSD/flash storage.</p> <p>Is the issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	H99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): SD Memory Card Cannot Be Inserted Into Slot


Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Cannot insert SD card into slot.• Can insert SD card only part way into slot.• Card slot does not align with enclosure. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Check that user's SD card is not warped or damaged, and that metal contacts are clean, intact and corrosion-free.2. Verify that SD card is the correct size. Card dimensions should be 32mm x 24mm x 2.1mm. Note: Cards thicker than 2.1mm are too thick and may damage card slot if inserted. Thinner cards such as MultiMediaCards (MMC) are acceptable. Refer to Apple Support article HT3553: About the SD and SDXC slot for further information.3. Verify that computer's SD card slot is not obstructed in any way. Use a flashlight to look into slot to make sure nothing is already inserted. If so, carefully remove obstruction from slot. Try to reinsert SD card again.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Insert known-good, formatted SD card into user's computer. Verify that it seats correctly.</p> <p>Does known-good SD card seat correctly when inserted?</p>	Yes	Issue resolved. Defective or incompatible SD card. Advise user to contact SD card vendor for support. Refer them to Apple Support article HT3553: About the SD and SDXC slot for further information.		
		No	Go to step 2.		
2.	<p>Remove LCD panel with glass.</p> <p>Remove chin strap to avoid bending or damaging it while aligning logic board.</p> <p>Loosen but do not remove all logic board screws. You should be able to shift board position slightly, both left to right and up and down. Take care to avoid damaging cabling or other components while moving logic board.</p> <p>Insert known-good SD card again.</p> <p>Can you now insert known-good SD card correctly?</p>	Yes	Go to step 3.		
		No	Replace logic board. Verify issue resolved.	M27	MLB
3.	<p>Hold the SD card reader in position and tighten all SD card reader screws. Insert the known-good SD card again.</p> <p>Can you now insert and remove known-good SD card correctly?</p>	Yes	Issue resolved with logic board alignment. Verify resolution.		
		No	Replace logic board. Verify issue resolved.	M27	MLB
4.	<p>Verify that a known-good SD memory card can be fully inserted into and ejected from slot and that it seats correctly.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): SD Memory Card Not Recognized

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card



Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">SD card does not appear on desktop or in System Information. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Make sure SD card is unlocked.Check that user's SD card is not warped or damaged and that metal contacts are clean, intact, and corrosion free.Verify that computer's SD card slot is not damaged or obstructed. Use a flashlight to inspect slot to make sure nothing is already inserted. If so, carefully remove obstruction from slot. Try to reinsert SD card.Verify that SD card is the correct size. Card dimensions should be 32mm x 24mm x 2.1mm. <p>Note: Cards thicker than 2.1mm are too thick and may damage card slot if inserted. Thinner cards such as MultiMediaCards (MMC) are acceptable. Refer to Apple Support article HT3553: About the SD and SDXC slot for further specifications.</p> <ol style="list-style-type: none">Consult Apple Support article HT3553: About the SD and SDXC slot and check for compatible SD card type and format.<ul style="list-style-type: none">SD card slot can accommodate cards that are Standard SD (Secure Digital) 4 MB to 2 GB, SDHC (Secure Digital High Capacity) 4 GB to 32 GB, and SDXC (Secure Digital Extended Capacity) 4GB to 2 TB. MMC cards can also be used in this slot.While SDIO (Secure Digital Input Output) cards fit into and shouldn't damage card slot, they are not supported.MiniSD and Micro SD cards require adapters.For a more specific SD card type or format (i.e., wireless-enabled SD card or other SD card) make sure the correct driver is installed. OS X supports only standard SD memory cards; other cards may require specific driver software.Make sure Finder Preferences > General is set to show External Disks.Check for and apply latest software and firmware updates.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Insert a known-good, formatted SD card into user's computer. Verify that card seats correctly. Does known-good SD card seat correctly when inserted?	Yes	Go to step 2.		
		No	Go to "SD Memory Card Cannot Be Inserted Into Slot" troubleshooting flow.		
2.	Verify that a known-good SD card appears in Disk Utility and mounts in Finder. Verify that computer can read data from and write data to card. Can computer read from and write to known-good SD card?	Yes	Go to step 5.		
		No	Go to step 3.		
3.	Start up user's computer with restore partition or up-to-date, bootable OS X volume. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Verify that a known-good SD card appears and mounts in Disk Utility and Finder. Can computer now read from and write to known-good SD card?	Yes	Repair permissions and directory using Disk Utility. If issue persists, restore OS X (with correct system build). Retest to verify resolution. Check that user has necessary driver software.		
		No	Go to step 4.		
4.	Check System Information to verify that SD card reader is listed in USB devices. Does SD card reader appear in System Information?	Yes	Go to step 5.		
		No	Replace logic board, which includes SD card reader. Verify issue resolved.	M27	MLB
5.	Insert user's SD card into user's computer. Verify that it seats correctly. Does user's SD card seat correctly when inserted?	Yes	Go to step 6.		
		No	Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to Apple Support article HT3553: About the SD and SDXC slot for further information.		
6.	Verify that SD card appears in left column of Disk Utility. If card does not appear, eject and reinsert card. If inserted too slowly, card may not appear. Does SD card appear in Disk Utility?	Yes	Go to step 8.		
		No	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	Insert user's SD card into a known-good computer. Verify that computer can read data from and write data to SD card.	Yes	Repair permissions and directory on user's computer using Disk Utility. If issue persists, restore OS X (with correct system build). Retest to verify resolution. Check that user has necessary driver software.		
	Can a known-good computer read from and write to user's SD card?	No	Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to Apple Support article HT3553: About the SD and SDXC slot for further information.		
8.	Verify that user's SD card volume appears in Disk Utility and mounts in Finder.	Yes	Go to step 10.		
	Does card volume mount in Finder or Disk Utility?	No	Go to step 9.		
9.	Format user's SD Card as OS X Extended Journaled with a GUID partition scheme.	Yes	Issue resolved by reformatting SD card. Verify resolution.		
	<p>Important: Make sure user has a valid backup first. If formatting is successful, retest SD card by writing data to and retrieving data from card.</p> <p>Were you able to reformat, then write to and read from the card successfully?</p>	No	Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to Apple Support article HT3553: About the SD and SDXC slot for further information.		

	Check	Result	Action	Code	Commodity
10.	<p>Test user's SD card by writing data to and retrieving data from card.</p> <p>Were you able to write to and read from user's card successfully?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Verify issue resolved.</p> <p>If the issue persists, contact TSPS for additional support.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	<p>Defective or incompatible SD card. Advise user to contact SD card manufacturer for support. Refer user to Apple Support article HT3553: About the SD and SDXC slot for further information.</p>		
11.	<p>Verify that user's computer can successfully read from and write to a known-good SD card.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Thunderbolt Target Disk Mode Issues

Unlikely causes:


Battery, camera, camera/Microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, power supply, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card


Quick Check



Symptoms	Quick Check
<ul style="list-style-type: none">Computer does not initiate Thunderbolt target disk mode connection.Computer does not show Thunderbolt floating icon after holding down T key during startup <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Check for and apply latest software and firmware updates. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. The correct build includes Thunderbolt drivers that match the logic board Thunderbolt controller.Check System Information > Hardware > Thunderbolt to verify that the Thunderbolt hardware is recognized.Review the section entitled "How do I get the best performance from Thunderbolt?" in Apple Support article HT5219: Thunderbolt ports and displays: Frequently asked questions (FAQ) to verify that the computer has the latest Thunderbolt firmware version installed.Between similar Mac models, if both a Thunderbolt and a FireWire cable are connected while activating target disk mode, Thunderbolt-enabled device will be the default. If either a Thunderbolt or FireWire storage device are disconnected after successfully entering target disk mode, the corresponding icon should disappear from display. See Apple Support article HT4614: About Thunderbolt to Thunderbolt cable (2 m).Try using a known-good Thunderbolt device or a Thunderbolt-capable computer in target disk mode. Refer to PH10725: OS X Mountain Lion: Transfer files between two computers using target disk mode.Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear startup sound for the second time.Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Correct build includes Thunderbolt drivers that match logic board Thunderbolt controller. Is the proper OS X build installed?	Yes	Go to step 2.		
		No	Refer to Apple Support article HT1159: Mac OS X versions (builds) for computers and reinstall correct OS X build and USB drivers for this computer model. Use Software Update to make sure newest revisions are installed. Verify issue resolved.		

	Check	Result	Action	Code	Commodity
2.	Apply latest software and firmware updates. Check System Information > Hardware > Thunderbolt. If no device is connected, Thunderbolt controller should be listed as iMac with unique user ID (UID) and firmware version shown. Does System Information list Thunderbolt hardware?	Yes	Go to step 4.		
		No	Go to step 3.		
3.	Reset PRAM by holding down Command-Option-P-R keys while booting, until you hear startup sound for the second time. Does System Information list Thunderbolt hardware?	Yes	Go to step 4.		
		No	Go to “Thunderbolt Not Recognized” troubleshooting flow.		
4.	Inspect Thunderbolt ports on user's computer for physical damage, burnt connectors or misalignment. Does Thunderbolt port show any damage?	Yes	Go to step 8.		
		No	Go to step 5.		
5.	To troubleshoot this issue completely, the following known-good parts are required: <ul style="list-style-type: none"> Thunderbolt-capable Mac Thunderbolt to Thunderbolt cable (2 m) Do you have immediate access to each of these known-good parts?	Yes	Go to step 6.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Request TSPS help checking latest updates and System Information > Hardware > Thunderbolt device tree.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
6.	Start up a known-good Thunderbolt-capable Mac in target disk mode by holding down T key. Connect known-good computer to user's computer using a known-good Thunderbolt cable. Start up user's computer and verify whether hard drive of the known-good computer appears on desktop of user's computer. Verify all available Thunderbolt ports. Does hard drive on known-good Mac mount to user's computer while using known-good cable?	Yes	Go to step 9.		
		No	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	<p>Verify that System Information > Hardware > Thunderbolt on user's computer lists Thunderbolt connection and target disk mode information for known-good computer.</p> <p>Does System Information list Thunderbolt target disk mode information?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support. Inform TSPS that user's computer cannot mount hard drive on a known-good iMac while in Thunderbolt target disk mode, while it does show Thunderbolt connection in System Information.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	Replace logic board. Thunderbolt hardware is present, but not fully functioning. Verify issue resolved.	M33	MLB
8.	<p>Check that physical damage or improper logic board mounting has not caused Thunderbolt port(s) to be out of alignment. Connect a Mini DisplayPort connector to Thunderbolt ports while mounting logic board to ensures proper alignment for cable insertion and removal. Rule out accidental damage before proceeding.</p> <p>Did logic board realignment correct the Thunderbolt port issue?</p>	Yes	Go to step 5.		
		No	Replace logic board. Verify issue resolved.	M24	MLB
9.	<p>Inspect user's Thunderbolt to Thunderbolt (2 m) cable for physical damage, such as contamination or burnt connectors on either end of the cable.</p> <p>Is user's Thunderbolt cable damaged?</p>	Yes	Replace Thunderbolt to Thunderbolt cable (2 m). Verify issue resolved.	X26	EXTERNAL CABLE
		No	Go to step 10.		
10.	<p>Connect user's Thunderbolt to Thunderbolt cable (2 m) to both computers. Start up known-good computer in target disk mode by holding down T key during startup. Restart user's computer and verify that known-good computer's hard drive mounts to desktop of user's computer.</p> <p>Does known-good computer's drive mount to user's desktop?</p>	Yes	Go to step 11.		
		No	Replace Thunderbolt to Thunderbolt cable (2 m). Verify issue resolved.	X26	EXTERNAL CABLE

	Check	Result	Action	Code	Commodity
11.	Continue verification of user's Thunderbolt to Thunderbolt cable (2 m) cable. Start up user's computer in target disk mode by holding down T key during startup. Restart known-good computer and verify that user's computer's hard drive mounts to desktop of known-good computer.	Yes	User's iMac and Thunderbolt cable pass inspections. Thunderbolt target disk mode issue resolved. Verify resolution.		
	Does user's computer's drive mount to known-good computer's desktop?	No	Go to step 12.		
12.	Substitute a known-good Thunderbolt to Thunderbolt cable (2 m) between known-good computer and user's computer. Restart user's computer in target disk mode by holding down T key during startup. Restart known-good computer and verify that user's computer's hard drive mounts to the desktop of known-good computer. Does user's computer's drive mount to known-good computer's desktop?	Yes	Replace Thunderbolt to Thunderbolt cable (2 m). Verify issue resolved.	X26	EXTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support. Inform TSPS that user's computer can mount a known-good Thunderbolt target disk mode computer hard drive, but cannot support being a target disk for other hosts.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
13.	Check System Information to confirm that Thunderbolt hardware is recognized and has a unique UID, most recent firmware version, and correct link status. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Burnt Smell / Odor


Unlikely causes:




Rear enclosure, stand


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"> Computer emits a burnt, smoky, or other unusual odor <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none"> Verify that computer is source of odor. Disconnect all third-party devices to eliminate external devices as source of odor. Odors can be related to how new the product is. Refer to Apple Support article HT4921: New equipment: Odors may be present short-term. Determine whether this is a safety issue. Refer to Apple Support article OP44: SERVICE: Handling Potential Product Safety Issues. Inspect enclosure and components for obvious signs of burning or smoky residue. Check rear vents, slots, ports, and power cord. Refer to Apple Support article TS4039: Smoke emitted may be from failed component. Inspect air intake vents and outlets for any obstructions. Make sure air can flow freely into and out of enclosure. Clean enclosure to eliminate odors resulting from external contamination. Refer to Apple Support article HT3226: How to clean Apple products. Explain cause to user. Verify functionality of computer. If computer is nonfunctional, troubleshoot that first as a separate issue.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Closely inspect computer for a possible safety issue. Have you identified any safety issues?	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for safety-related issues. Click Help button in GSX toolbar > Technical Help with a Repair > Contact Apple. Refer to Apple Support article OP44: SERVICE: Handling Potential Product Safety Issues.</p>	T99	
		No	Go to step 2.		
2.	Odor can be related to external contamination. Inspect computer exterior for contamination or lack of cleanliness. Can you determine that odor is caused by external contamination?	Yes	Go to step 3.		
		No	Go to step 4.		

	Check	Result	Action	Code	Commodity
3.	<p>Thoroughly clean entire enclosure and all external surfaces. Refer to Apple Support article HT3226: How to clean Apple products. Explain cause to the user.</p> <p>Does user agree that odor is due to external contamination?</p>	Yes	Issue resolved. Verify resolution.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
4.	<p>Odors can be related to how new the product is. Refer to Apple Support article HT4921: New equipment: Odors may be present short-term.</p> <p>Can you determine that odor is due to newness?</p>	Yes	Go to step 5.		
		No	Go to step 6.		
5.	<p>Explain to user that new computers can sometimes emit an odor similar to odors generated by new carpeting or a new car. In most cases, odor dissipates after a brief period. Refer user to Apple Support article HT4921: New equipment: Odors may be present short-term.</p> <p>Does user agree odor is related to computer's newness?</p>	Yes	Issue resolved. Verify resolution.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
6.	<p>Inspect each module and its associated cables for signs of burnt or damaged components, smoke residue or other traces of burning, and melted or damaged wiring.</p> <p>Have you identified a component failure as source of odor?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS to troubleshoot burnt or failed components. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	Go to step 7.		

	Check	Result	Action	Code	Commodity
7.	<p>Closely inspect internal components and enclosure for indications of physical damage or internal contamination.</p> <p>Can you identify signs of internal damage or contamination?</p>	Yes	Go to step 9.		
		No	Go to step 8.		
8.	<p>Inform the user that computer failures due to accidental damage are not covered under any Apple warranty, including AppleCare. If applicable, discuss out-of-warranty repair options.</p> <p>Does user want to proceed with out-of-warranty repair?</p>	Yes	Proceed with Out of Warranty repair. Verify resolution.		
		No	Issue resolved. Return computer to user using correct positioning.		
9.	<p>Run computer for several hours and check for the issue/odor. Test with both Apple Service Diagnostic (ASD) EFI and ASD OSX. If no functional failure is detected, use correct positioning to explain to user that odor is most likely related to external contamination or newness of computer. Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Computer Runs Hot

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, DisplayPort cable, HDD data cable, HDD power cable, left speaker, memory, rear enclosure, right speaker, stand, WiFi/Bluetooth antenna(s), wireless card


Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• Computer feels unusually warm.• Fan is not operating.• Fan is not functioning to its full capacity.• Fan runs constantly at high speeds. <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Run Mac Resource Inspector (MRI) to verify correct operation of sensors and fan.2. Check for and apply latest software and firmware updates.3. Inspect fan performance during operation to make sure fan is spinning. Check that the vents are not blocked, and if necessary, use compressed air to remove dust or debris from rear fan exhaust.4. Compare computer's operating temperature to a known-good, similarly configured computer.5. Check for runaway applications using Apple Support article TS1473: Runaway applications can shorten battery runtime, affect performance and increase heat and fan activity. Follow instructions to halt any processes that are using excessive system resources.6. Processor-intensive/graphics-intensive applications and system processes may cause the enclosure to feel warm. Use Activity Monitor to identify these types of programs and explain issue to user.7. Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).8. Verify that computer's internal hard drive or Solid State Drive (SSD)/flash storage is an Apple-installed part. Compare hard drive information in System Information to the Apple Hard Drives Matrix in Apple Support article SM155: Hard Drives Matrix to determine whether user's installed drive is one of OEM drives available for this computer configuration. Third-party hard drives without correct firmware or thermal sensors, or outside this computer's specifications, may cause computer to run hot or permanently activate fan at full speed. In such cases, inform user that computer has been modified from its original, supported configuration, and that such a repair would not be covered under Apple warranty.



Deep Dive


	Check	Result	Action	Code	Commodity
1.	Run Mac Resource Inspector (MRI) to check for correct fan operation and current status of thermal sensors. MRI will report a failure if a fan isn't rotating or a sensor is undetected or exceeding thermal values.	Yes	Go to step 2.		
		No	Go to step 8.		
	Does computer pass all MRI checks?				

	Check	Result	Action	Code	Commodity
2.	Use the extended version of CSD to verify proper function of the following subsystems: <ul style="list-style-type: none"> • SMC • Fan • Thermal sensors • CPU–heat sink thermal interface Does computer pass all CSD checks?	Yes	Computer passed all CSD checks. Verify operation and refer user to Apple Support article HT4543: Learn about the fans in your Mac .		
		No	Go to step 3.		
3.	Inspect fan and heat sink fin stacks. Partial disassembly of computer may be required to access fan and heat sink. Use an ESD-safe vacuum to remove any dust or debris. Reassemble and retest using CSD. Does computer pass all CSD checks?	Yes	Issue resolved by cleaning airflow. Verify resolution.		
		No	Go to step 4.		
4.	To troubleshoot this issue completely, a known-good fan is required. Do you have immediate access to known-good fan?	Yes	Go to step 5.		
		No	Replace non-rotating or slower fan. Verify issue resolved.	X22	OTHER ELECTRIC
5.	Substitute a known-good fan and retest using MRI and CSD. Does computer now pass MRI checks and ASD loop tests?	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 6.		
6.	To troubleshoot this issue completely, a known-good logic board is required. Do you have immediate access to a known-good logic board?	Yes	Go to step 7.		
		No	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
7.	Continue to use known-good fan. Substitute a known-good logic board. Reassemble computer and retest with MRI. Do both known-good fan and logic board pass MRI and run-in tests?	Yes	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
		No	Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
8.	A disconnected fan will prevent proper cooling and cause thermal sensors to exceed expected values. Does MRI report a fan motor test failure?	Yes	Go to step 9.		
		No/Other	Go to step 15.		
9.	Power off computer, remove LCD panel with glass. Use iMac (21.5-inch, Late 2012, Early 2013, Late 2013) Functional Overview or iMac (27-inch, Late 2012, Late 2013) Functional Overview table to locate affected fan connection to logic board. Disconnect fan cable connector and inspect logic board and fan cable connector pins for damage. Is there any cable or connector damage on fan or logic board?	Yes	Go to step 10.		
		No	Go to step 12.		

	Check	Result	Action	Code	Commodity
10.	Identify whether fan, logic board, or both are damaged.	Yes	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	L99	
	Are both fan and logic board damaged?	No	Go to step 11.		
11.	Identify whether fan or logic board is damaged.	Fan	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
	Which part is damaged?	Logic Board	Replace logic board. Verify issue resolved.	M24	MLB
12.	Remove all fan screws and extract fan to reveal heat sink or fan air duct. Use an ESD-safe vacuum to remove dust or debris from inner side of heat sink fin stack. Clean fan rotor blades. Reinstall fan and reseal fan cable connection to logic board. Reassemble and retest with MRI.	Yes	Issue resolved by cleaning and reseating fan connection. Verify resolution.		
	Does computer pass fan motor check?	No	Go to step 13.		
13.	To troubleshoot this issue completely, a known-good fan is required.	Yes	Go to step 14.		
	Do you have immediate access to a known-good fan?	No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
14.	Substitute a known-good fan, and retest using MRI.	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
	Does computer now pass fan motor check?	No	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
15.	Any under/overheated, clogged, disconnected, shorted, or failing sensor will cause computer to operate fan at higher speed(s).	Yes	Go to step 16.		
	Does MRI report a Txxx thermal sensor test failure?	No/Other	Go to step 27.		

	Check	Result	Action	Code	Commodity
16.	Accumulated dust in fan or heat sink may not permit proper cooling. <ul style="list-style-type: none"> Remove all fan screws and extract fan to reveal heat sink. Use an ESD-safe vacuum to remove dust or debris. Clean fan rotor blades using soft brush. Reinstall fan and reseat fan cable connection to logic board. Reassemble and retest with MRI.	Yes	Go to step 17.		
		No	Issue resolved by cleaning and reseating fan cable connection. Verify resolution.		
	Does MRI still report a Txxx thermal sensor test failure?				
17.	Identify whether sensor is one of the following: TCXr, TC0p, TG0d, TG0p, TPCD, TA0p, TM0p, TM1p, TM2p, TM3p, Tm0p, Tm1p, Tm2p, Tb0p.	Yes	Replace logic board. Verify issue resolved.	M23	MLB
		No	Go to step 18.		
	Is failing thermal sensor listed?				
18.	Identify whether sensor currently failing MRI test is TH0o or TH1R.	Yes	Go to step 19.		
		No	Go to step 23.		
	Is TH0o or TH1R thermal sensor failing test?				
19.	Verify in Apple Support article SM155: Drives Matrix that the installed hard drive or flash storage/SSD model is compatible with this computer configuration.	Yes	Go to step 20.		
		No	Unsupported HDD/SSD installed, or missing/incorrect hard drive thermal sensor. Check with user for out-of-warranty resolution. Verify resolution.		
	Is installed HDD/flash storage/SSD compatible with this model?				
20.	Identify the type of storage device affected: <ul style="list-style-type: none"> TH0o - Hard Disk Drive (HDD) TH0O - Hard Disk Drive (HDD) TH1R - Flash Storage/Solid-State Drive (SSD) 	HDD	Go to step 21.		
		Flash Storage/SSD	Replace the user's flash storage/SSD. Verify issue resolved.	H85	SSD
	Is the affected device an HDD or a flash storage/SSD?				
21.	To troubleshoot this issue completely, a known-good HDD data cable is required.	Yes	Go to step 22.		
		No	Replace the user's hard drive. Verify issue resolved.	H85	HDD
	Do you have immediate access to a known-good HDD cable?				
22.	Substitute a known-good HDD data cable and retest using MRI.	Yes	Replace the user's hard drive data cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	Reinstall user's HDD data cable. Replace the user's hard drive. Verify issue resolved.	H85	HDD
	Does computer now pass the THxx sensor check?				

	Check	Result	Action	Code	Commodity
23.	Identify whether sensor currently failing MRI test is Tp2h.	Yes	Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
	Is Tp2h thermal sensor failing test?	No	Go to step 24.		
24.	Identify whether sensor currently failing MRI test is TL0p or TL1p. Is TL0p or TL1p thermal sensor failing test?	Yes	Go to step 25.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
25.	To troubleshoot this issue completely, a known-good LCD panel with glass is required. Do you have immediate access to a known-good LCD display panel with glass?	Yes	Go to step 26.		
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD
26.	Substitute a known-good LCD panel with glass, and retest using MRI. To troubleshoot this issue completely, a known-good power supply is required. Does MRI still report a TL0p or TL1p thermal sensor test failure?	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	L99	
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD

	Check	Result	Action	Code	Commodity
27.	<p>Other voltage and current sensors are also tested by MRI. Any failure to read them or any unexpected value will lead MRI to report a test failure.</p> <p>Does MRI report a Vxxx or Ixxx test failure?</p>	Yes	Go to step 28.		
		No/Other	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
28.	<p>Some power-related sensors are located in power supply, but are read through a SMBus connection to logic board.</p> <p>Does MRI report a VDxx or IDxx test failure?</p>	Yes	Go to step 29.		
		No/Other	Go to step 32.		
29.	<p>Reseat DC power cable connection to logic board. Reassemble and retest, using MRI.</p> <p>Does MRI still report a VDxx or IDxx sensor test failure?</p>	Yes	Go to step 30.		
		No	Issue resolved by reseating DC power cable connection between power supply and logic board. Verify resolution.		
30.	<p>To troubleshoot this issue completely, a known-good power supply is required.</p> <p>Do you have immediate access to a known-good power supply?</p>	Yes	Go to step 31.		
		No	Reinstall user's DC power cable. Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
31.	<p>Substitute a known-good power supply, reassemble and retest using MRI.</p> <p>Does MRI still report a VDxx or IDxx sensor test failure?</p>	Yes	Reinstall user's DC power cable and power supply. Replace logic board. Verify issue resolved.	M18	MLB
		No	Reinstall user's DC power cable. Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
32.	<p>Most voltage and current regulators are located on logic board. To troubleshoot this issue completely, a known-good logic board is required.</p> <p>Do you have immediate access to a known-good logic board?</p>	Yes	Go to step 33.		
		No	Replace logic board. Verify issue resolved.	M18	MLB

	Check	Result	Action	Code	Commodity
33.	Substitute a known-good logic board, reassemble and retest using MRI.	Yes	Reinstall user's logic board. Replace power supply. Verify issue resolved.	P17	POWER SUPPLY
	Does MRI still report a Vxxx or lxxx sensor test failure?	No	Replace logic board. Verify issue resolved.	M18	MLB

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Mechanical/Physical/Cosmetic Damage


Unlikely causes:

N/A

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none"> • Broken glass • Bent stand • Broken hinge • Stripped screw/head • Stripped screw boss/threads • Dented or scratched enclosure • Cracked LCD • Scorched or melted LCD • LCD impact damage <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<p>Inspect computer and discuss nature of issue with user. Determine whether user wants to proceed with repair (despite possible accidental damage) or pursue other service options. Click “No” to proceed with further troubleshooting.</p>

Deep Dive

	Check	Result	Action	Code	Commodity
1.	<p>Determine cause of damage or defect: user/technician, environment, accidental damage, or abuse.</p> <p>Is an Apple agent responsible for damage or defect on computer?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for assistance with Apple-related accidental damage.</p> <p>Click Help button in GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	<p>Proceed with resolution or repair using proper positioning. Inform user that computer failures due to accidental damage are not covered by Apple’s one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p>	L99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Noise/Hum/Vibration

Unlikely causes:

Battery, camera, camera/microphone/ALS cable, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, logic board, memory, rear enclosure, right speaker, solid state drive (SSD)/flash storage card, stand, WiFi/Bluetooth antenna(s), wireless card

Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none">• Buzzing noise• Rattling noise• Ticking noise• Squeaking noise• Humming noise• High frequency noise• Mechanical vibration <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Work with user to reproduce issue and isolate source of noise. Differentiate whether noise is coming from computer or a connected peripheral. Disconnect all third-party peripherals to isolate source of noise.2. Determine whether sound is normal or abnormal. Refer to Apple Support article TS3204: iMac: Evaluating normal noises for more information.3. If iMac fan runs at full speed after computer turns on, you may need to reset iMac's SMC. Refer to Apple Support articles TS1433: iMac: Fans run at full speed after computer turns on and HT4543: Learn about the fans in your Mac for more information. Reset SMC using procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).4. Verify that vents on bottom and back of computer are free of dust and other obstructions that might inhibit proper airflow through computer.5. Launch Applications > Utilities > Activity Monitor. Determine whether an application or process is consuming a high percentage of CPU bandwidth. CPU-intensive applications can cause fan to run fast in order to maintain proper internal computer temperatures. If needed, quit application or restart computer to resolve issue.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Disconnect any peripheral devices, cards, or cables attached to computer. Has the noise been eliminated?	Yes	Issue resolved. Issue caused by ground loop induced by third-party devices. Advise user to connect all devices to a common power outlet or contact device manufacturer for support.		
		No	Go to step 2.		
2.	Tilt display to hinge limits to determine whether mechanical noise is generated by hinge mechanism. Is the noise coming from iMac's display hinge?	Yes	Go to "Stand/Hinge Issues" troubleshooting flow.		
		No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	Shut down computer and remove LCD panel with glass.	Yes	Replace power supply. Verify issue resolved.	P04	POWER SUPPLY
	Connect computer to AC power and listen carefully around power supply to verify whether it is source of noise.				
	<p>WARNING: HIGH VOLTAGE</p> <p>Use extreme caution when working around power supply module, which contains high-voltage capacitors that may remain charged for several minutes even when computer is unplugged. Never touch power supply until it has had sufficient time to discharge.</p> <p>Is noise coming from iMac's power supply?</p>	No	Go to step 4.		
4.	Shut down computer. If you reinstalled LCD panel with glass, remove it.	Yes	Issue resolved by removing loose objects inside chin area.		
	Hold computer firmly with both hands and invert computer while gently shaking it, to attempt to dislodge and remove any loose screws or other foreign objects that may have fallen down inside the computer into the chin area.				
	Loose objects in the chin area can cause noise or vibration, especially during audio playback.	No	Go to step 5.		
5.	Briefly retest for noise, hum, or vibration.				
	Has noise been eliminated?				
	Shut down computer and let it cool off fully. Check for noise, hum or vibration during startup when computer is cold.	Yes	Go to step 6.		
6.	Does issue happen on or after a cold startup?	No	Go to step 12.		
	An unreadable thermal sensor can cause fan to run excessively. Run Mac Resource Inspector (MRI) to check thermal sensors.	Yes	Go to "Computer Runs Hot" troubleshooting flow.		
7.	Does MRI report any thermal sensor failures?	No	Go to step 7.		
	Excessive fan operation may also occur if computer is unable to read fan speed. Check MRI results for fan (motor) sensor test results.	Yes	Go to step 8.		
8.	Does MRI report any fan (motor) failures?	No	Go to step 10.		
	To troubleshoot this issue completely, a known-good fan is required.	Yes	Go to step 9.		
8.	Do you have immediate access to known-good fan?	No	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC

	Check	Result	Action	Code	Commodity
9.	Substitute known-good fan and retest with MRI.	Yes	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
	Does known-good fan pass fan (motor) test in MRI?	No	Reinstall user's fan. Replace the logic board. Verify issue resolved.	M23	MLB
10.	Disconnect fan and briefly retest for noise, hum or vibration.	Yes	Go to step 11.		
	Has noise been eliminated?	No	Go to step 12.		
11.	Verify whether any tape, gasket, cable label, cable, or other material is touching fan blades and causing a ticking or buzzing noise. Secure material so it does not touch fan blades. If tape adhesive has lost its stickiness, replace that section of tape.	Yes	Issue resolved by securing internal components or material to prevent touching fan blades. Verify resolution.		
	Remove fan and rotate blades. Verify that fan blades spin smoothly without interference from fan housing, cables, tape, gaskets or other components.				
	Reinstall fan while carefully ensuring that there are no cables routed under or near fan assembly that might cause interference with fan blades. After reassembling computer, verify whether noise issue is resolved.	No	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
12.	Depending on configuration, there may or may not be a hard drive installed. Other configurations may have either a flash storage card or both flash storage and HDD.	Yes	Go to step 13.		
	Is a hard drive installed in computer?	No	Go to step 14.		
13.	Remove internal hard drive and start up computer from recovery partition or an up-to-date, bootable OS X volume.	Yes	Go to "HDD Noisy" troubleshooting flow.		
	Has noise been eliminated?	No	Go to step 14.		
14.	Play sound sample at loud and soft volume levels to determine whether noise is caused by left/right speakers or amplifier circuit. Plug in external headphones to identify whether noise comes from audio out or from other source. Mute computer volume. Verify whether issue still occurs.	Yes	Go to "Distorted Audio from Internal Speaker(s)" troubleshooting flow.		
	Has noise been eliminated?	No	Go to step 15.		
15.	To troubleshoot this issue completely, a known-good fan is required.	Yes	Go to step 16.		
	Do you have immediate access to a known-good fan?	No	Go to step 17.		
16.	Substitute known-good fan and retest.	Yes	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
	Has noise been eliminated?	No	Go to step 18.		

	Check	Result	Action	Code	Commodity
17.	Disconnect fan and briefly retest for noise, hum, or vibration. Has noise been eliminated?	Yes	Replace fan. Verify issue resolved.	X23	OTHER ELECTRIC
		No	Go to step 18.		
18.	<p>With hard drive and fan disconnected, briefly retest once again while listening closely for any noise, hum, or vibration coming from logic board and heat sink assembly.</p> <p>Inspect logic board and heat sink assembly for any damage that may have occurred during removal or replacement.</p> <p>Logic board and heat sink assembly must be treated as a single unit during removal or replacement. All screws must be removed from both components prior to physically pulling or pushing either component.</p> <p>Any mishandling of heat sink assembly that is attached to logic board can cause damage to heat pipes connecting these components.</p> <p>If heat pipes become even slightly damaged (e.g. bent, kinked, etc.), normal heat removal cycle can become disrupted, causing a repetitive hammering noise from this area. Damage may not be visibly noticeable.</p> <p>Noise may be mistaken for a faulty hard drive. Check for this noise with hard drive and fan disconnected.</p> <p>Is there noise coming from logic board and heat sink assembly?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 19.		
19.	<p>Noise may be related to interference from other electrical devices operating near computer or plugged into same power outlet. See whether noise is eliminated when computer runs in a different location on a different circuit.</p> <p>Has noise been eliminated?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Stand/Hinge Issues



Unlikely causes:

Not relevant

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Bent standBroken hingeStripped screw/headStripped screw boss/threadsLoose stand and/or hinge <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Inspect computer and discuss nature of issue with user. Determine whether user wants to proceed with repair (despite possible accidental damage) or pursue other service options.Click "No" to proceed with further troubleshooting.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Determine cause of damage or defects: user/technician, environment, accidental damage, or abuse. Is an Apple agent responsible for damage or defect on the computer?	Yes	 ESCALATION REQUIRED. Contact TSPS for assistance with Apple-related accidental damage. Click Help button in GSX Toolbar > Technical Help with a Repair > Contact Apple.	X99	
		No	Go to step 2.		
2.	Inspect stand to determine whether it requires replacement. Verify that stand securely holds computer in its upright position without wobbling when placed on a hard, smooth, even surface. Is stand damaged or defective?	Yes	 ESCALATION REQUIRED. Replace stand. Verify issue resolved. Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or AppleCare Protection Plan. Refer to www.apple.com/legal/warranty . Contact TSPS for additional support regarding warranty coverage for this part. Click Help button in GSX Toolbar > Technical Help with a Repair > Contact Apple.	X99	
		No	Go to step 3.		

	Check	Result	Action	Code	Commodity
3.	<p>Inspect hinge mechanism to determine whether it requires replacement.</p> <p>Adjust computer back and forth on its hinge, listening for hinge noise. Check feel of the hinge. Its movement should feel firm—not tight or loose—as it holds the iMac in position. Hinge should operate smoothly along its entire travel.</p> <p>Is hinge mechanism damaged or defective?</p>	Yes	<p>Replace hinge mechanism. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p>	X12	PIECE PART
		No	Go to step 4.		
4.	<p>Place the customer's iMac on a solid, flat surface.</p> <p>Have another person apply downward pressure to the stand to hold it down on that solid surface.</p> <p>Firmly grasp both sides of the iMac enclosure, and gently attempt to rotate the entire enclosure left and right while facing the display. The enclosure should not be able to move in this direction.</p> <p>Compare this behavior with a known-good, similar iMac model.</p> <p>If the enclosure rotates an abnormal amount, the mechanism mounts inside the rear enclosure may no longer be securely attached, which may require a rear enclosure replacement.</p> <p>Does the iMac's enclosure rotate an abnormal amount?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Replace the rear housing. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX Toolbar > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Go to step 5.		
5.	<p>Verify that both stand and hinge operate properly and that they securely hold the iMac upright in all appropriate positions.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Intermittent Shutdown

Unlikely causes:


Battery, camera, camera/microphone/ALS cable, DisplayPort cable, left speaker, memory, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antennas, wireless card


Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none">Shuts down during startupShuts down unexpectedly during useComputer restarts spontaneouslyPowers off when waking from sleep <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Collect details from user regarding shutdown occurrence and system configuration: when shutdown occurs (for example, after running for a while); frequency of shutdowns; which applications are running; and shutdown repeatability.Make sure that power cord is securely attached to back of computer, and is not hindered by a desk or other furniture.Plug computer directly into an AC outlet rather than into a surge protector or UPS.Open System Preferences > Energy Saver > Schedule and make sure that a “Shut Down” event is not scheduled.Use OS X Recovery to troubleshoot potential software issues. Hold down Command (⌘) during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.Hold Shift key during startup to put computer into Safe Mode. See Apple Support article HT1564: Mac OS X: What is Safe Boot, Safe Mode?Run Mac Resource Inspector (MRI) to check fan (motor) speed and thermal/voltage/current sensor detection and values.Reset SMC using the procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time.If the iMac is internally equipped with both a hard drive and a solid state drive (SSD), refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Run Apple Service Diagnostic (ASD) or Macintosh Resource Inspector (MRI) and consult MRI logs to check for fan (motor) or sensor failures.	Yes	Go to step 2.		
	Sensor(s) that indicate they are out of normal operating range or an inoperative fan can cause intermittent shutdowns.	No	Go to step 6.		
	Did ASD/MRI report any fan or sensor failures?				

	Check	Result	Action	Code	Commodity
2.	<p>MRI may report a voltage out of range error, either over- or under-voltage, from the power supply. This out-of-range voltage issue with power supply can cause intermittent shutdowns.</p> <p>iMac power supply related sensor names are:</p> <p><u>Sensor - MRI Sensor Name</u> Voltage (VDPr) - Primary AC/DC Voltage (VDSR) - Secondary AC/DC Voltage (VD0R) - 12V S0 Voltage (VD2R) - Power Supply 12V S0</p> <p>Any one of the above sensors being out of range is typically related to power supply or incoming AC power.</p> <p>Did MRI report failure of a power supply sensor listed above?</p>	Yes	Go to step 3.		
		No	Go to step 11.		
3.	<p>Remove AC power and wait for power supply to discharge. Open computer. Inspect and reseal DC power cable while looking for cable pinch, wire exposure, or connector damage. Also inspect power supply and logic board connectors for damaged housing, and bent or burnt pins.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 4.		
		No	Go to step 5.		
4.	<p>Identify whether DC power cable is the only damaged component. Damage to multiple parts will require an escalation to TSPS.</p> <p>Is damaged limited to DC power cable only?</p>	Yes	Replace DC power cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	


	Check	Result	Action	Code	Commodity
5.	<p>After reseating DC power cable, use an external monitor or connect LCD panel to rerun MRI and verify if power supply voltage sensor still gives an error.</p> <p>iMac power supply related sensor names are:</p> <p><u>Sensor - MRI Sensor Name</u> Voltage (VDPr) - Primary AC/DC Voltage (VDSR) - Secondary AC/DC Voltage (VD0R) - 12V S0 Voltage (VD2R) - Power Supply 12V S0</p> <p>Did MRI report failure of a power supply sensor listed above?</p>	Yes	Replace power supply. Verify issue resolved.	P02	POWER SUPPLY
		No	Go to step 6.		
6.	<p>Start up from internal drive and attempt to reproduce shutdown symptom(s).</p> <p>Can you reproduce shutdown event?</p>	Yes	Go to step 7.		
		No	Go to step 8.		
7.	<p>Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.</p> <p>Does shutdown issue persist?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	Repair disk directory using Disk Utility. If the issue persists after repair, refer to Apple Support article HT1159: Mac OS X versions (builds) for computers , and install the correct OS X version and build on user's hard drive. Check for and apply latest software and firmware updates. Verify issue resolved.		


	Check	Result	Action	Code	Commodity
8.	Run ASD in OS loop mode for 8-10 hours, then verify whether computer unexpectedly shut down. Did computer shutdown unexpectedly?	Yes	Go to step 9.		
		No	No failure found when looping ASD tests. Using correct positioning, return computer to user with no trouble found. Verify issue resolved.		
9.	Check diagnostic logs to see whether ASD is conducting the same test each time computer unexpectedly shuts down. Does computer consistently shut down during the same ASD test?	Yes	Go to step 10.		
		No	Replace logic board. Verify issue resolved.	M23	MLB
10.	Rerun ASD loop tests until computer unexpectedly shuts down, then immediately run MRI to see whether a sensor error is found while computer is still hot. Verify whether MRI (or MRI log on AST server) reports any sensor test failures. Does MRI report any sensor test failures?	Yes	Go to step 11.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
11.	Determine specific type of failure reported in MRI/ASD: thermal/fan sensor or voltage/current sensor. <ul style="list-style-type: none"> • MRI thermal sensors begin with Txxx. • MRI electrical voltage sensors begin with Vxxx. • MRI electrical current sensors begin with Ixxx. Which sensor failure does MRI/ASD report?	Voltage/Current Sensor	Replace logic board. Verify issue resolved.	M23	MLB
		Thermal/Fan Sensor	Go to step 12.		
12.	Identify specific type of failure reported in MRI/ASD: thermal sensor or fan (motor) error. MRI thermal sensors begin with Txxx. Which sensor failure does MRI/ASD report?	Fan (Motor)	Go to step 13.		
		Thermal	Go to step 18.		


	Check	Result	Action	Code	Commodity
13.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.</p> <p>iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012 and Late 2013) computers have a single fan. Locate fan and inspect fan cable and connector for damage, and make sure fan blades aren't obstructed.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Is fan damaged or blocked?</p>	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 14.		
14.	<p>Inspect fan cable connectors on logic board for damaged pins, and missing or broken connector housing.</p> <p>Is logic board damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 15.		
15.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Reseat fan cable connector to logic board and retest using MRI/ASD.</p> <p>Does MRI/ASD still report a fan error?</p>	Yes	Go to step 16.		
		No	Run ASD in OS loop mode to verify that computer does not unexpectedly shut down. Verify issue resolved.		
16.	<p>To troubleshoot this issue completely, a known-good fan is required.</p> <p>Do you have immediate access to a known-good fan?</p>	Yes	Go to step 17.		
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
17.	<p>Important: Ensure that user's computer is shut down, then remove the power cord and wait two minutes for self discharge to occur.</p> <p>Substitute a known-good fan and retest using MRI/ASD.</p> <p>Does MRI/ASD still report a fan error?</p>	Yes	Replace logic board. Reinstall user's fan. Verify issue resolved.	M18	MLB
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC

	Check	Result	Action	Code	Commodity
18.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.</p> <p>Remove fan. Inspect fan and inner heat sink fin stack of CPU for obstructions. Clean and remove any obstructions or debris. Reinstall fan and retest with MRI/ASD.</p> <p>MRI thermal sensors begin with Txxx.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Does MRI/ASD still report a thermal sensor error?</p>	Yes	Go to step 19.		
		No	Run ASD in OS loop mode to verify that computer does not unexpectedly shut down. Verify issue resolved.		
19.	<p>LCD thermal sensor failure alone can cause an unexpected shutdown. It may also affect logic board thermal sensors that are connected in parallel on logic board.</p> <p>LCD thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u> Temperature (TL0p) - LCD proximity Temperature (TL1p) - TCON proximity</p> <p>Does MRI/ASD report an LCD thermal sensor error (TL0p/TL1)?</p>	Yes	Go to step 20.		
		No	Go to step 28.		
20.	<p>The TL0p sensor is attached on back of the LCD panel, while the TL1p sensor is part of LCD logic board. Identify which one of these sensors report an error when running diagnostics.</p> <p>Does MRI/ASD report a TL0p or TL1p sensor error?</p>	TL0p	Go to step 21.		
		TL1p	Replace LCD panel with glass. Verify issue resolved.	L85	LCD


	Check	Result	Action	Code	Commodity
21.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.</p> <p>Inspect thermal sensor, cable, and connector, for damage.</p> <p>TL0p LCD thermal sensor is attached with tape to rear of LCD panel with glass with a short, thin cable. This sensor does not connect to logic board. It connects to a thermal sensor board mounted on LCD panel.</p> <p>LCD thermal sensor signals are encoded on this board (which is part of the LCD panel), and this information is sent to logic board through DisplayPort cable.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 27.		
		No	Go to step 22.		
22.	<p>Reseat LCD thermal sensor cable to thermal sensor board mounted on LCD and reseat DisplayPort connector on logic board. Retest using MRI/ASD.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Does MRI/ASD still report an LCD thermal sensor error (TL0p)?</p>	Yes	Go to step 23.		
		No	Run ASD in OS loop mode to verify that computer does not unexpectedly shut down. Verify issue resolved.		
23.	<p>To troubleshoot this issue completely, a known-good LCD thermal sensor cable is required.</p> <p>Note: LCD thermal sensor cable is available separately. A replacement LCD panel with glass also comes with a new LCD thermal sensor cable already attached.</p> <p>Do you have immediate access to a known-good LCD thermal sensor cable?</p>	Yes	Go to step 24.		
		No	Replace LCD thermal sensor cable. Verify issue resolved.	X03	INTERNAL CABLE
24.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD thermal sensor cable and retest using MRI/ASD.</p> <p>Does MRI/ASD still report an LCD thermal sensor error (TL0p)?</p>	Yes	Go to step 25.		
		No	Replace LCD thermal sensor cable. Verify issue resolved.	X03	INTERNAL CABLE



	Check	Result	Action	Code	Commodity
25.	<p>To troubleshoot this issue completely, a known-good LCD panel with glass is required.</p> <p>Note: LCD thermal sensor cable is available separately. A replacement LCD panel with glass also comes with a new LCD thermal sensor cable already attached.</p> <p>Do you have immediate access to a known-good LCD panel with glass?</p>	Yes	Go to step 26.		
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD
26.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good LCD panel with glass, and retest using MRI/ASD.</p> <p>Does MRI/ASD still report an LCD thermal sensor error (TL0p)?</p>	Yes	Replace logic board. Reinstall user's LCD thermal sensor cable. Verify issue resolved.	M23	MLB
		No	Replace LCD panel with glass. Verify issue resolved.	L85	LCD
27.	<p>Identify whether LCD thermal sensor cable is the only damaged component. Damage to multiple parts will require an escalation to TSPS.</p> <p>Is damaged limited to LCD thermal sensor cable only?</p>	Yes	Replace LCD thermal sensor cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
28.	<p>Hard drive thermal sensor failure alone can cause an unexpected shutdown. It can also affect logic board thermal sensors that are connected in parallel on logic board.</p> <p>Hard drive thermal sensor names: <u>Sensor - MRI Sensor Name</u> TH00 - Hard drive proximity TH0o - Hard drive Out of Band</p> <p>Does MRI/ASD report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Go to step 29.		
		No	Go to step 36.		

	Check	Result	Action	Code	Commodity
29.	<p>Newer iMacs have a thermal sensor built-in to the hard drive. Third-party hard drives may not have this sensor present and should flag a TH0o error. If user's hard drive is third-party, you may wish to explain to user that repair should continue with a known-good Apple hard drive.</p> <p>Is a third-party hard drive installed?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
		No	Go to step 30.		
30.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>The thermal sensor internal to the hard drive is wired through hard drive data cable to logic board. Inspect hard drive data cable, hard drive connector, and logic board connector for damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 35.		
		No	Go to step 31.		
31.	<p>Reseat hard drive data cable to both hard drive and logic board, then retest using MRI/ASD.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Does MRI/ASD still report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Go to step 32.		
		No	Run ASD in OS loop mode to verify that computer does not unexpectedly shut down. Verify issue resolved.		
32.	<p>To troubleshoot this issue completely, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Hard drive • Hard drive data cable <p>Do you have immediate access to each of these known-good parts?</p>	Yes	Go to step 33.	X03	INTERNAL CABLE
		No	Replace hard drive data cable. Verify issue resolved.		

	Check	Result	Action	Code	Commodity
33.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good hard drive data cable and retest using MRI/ASD.</p> <p>Does MRI/ASD still report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Go to step 34.		
		No	Replace hard drive data cable. Verify issue resolved.	X03	INTERNAL CABLE
34.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good hard drive and retest using MRI/ASD.</p> <p>Does MRI/ASD still report a hard drive thermal sensor error (TH0o/TH0O)?</p>	Yes	Replace logic board. Reinstall user's hard drive and hard drive data cable. Verify issue resolved.	M23	MLB
		No	Replace hard drive. Reinstall user's hard drive data cable. Verify issue resolved.	H85	HDD
35.	<p>Identify whether hard drive data cable is the only damaged component. Damage to multiple parts will require an escalation to TSPS.</p> <p>Is damaged limited to hard drive data cable only?</p>	Yes	Replace hard drive data cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
36.	<p>iMacs with a solid state drive (SSD)/flash storage card have a thermal sensor built-into the SSD/flash storage card.</p> <p>SSD/flash storage thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u> TH1R - SSD Out of band</p> <p>Does MRI/ASD report an SSD/flash storage thermal sensor error (TH1R)?</p>	Yes	Go to step 37.		
		No	Go to step 42.		

	Check	Result	Action	Code	Commodity
37.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>The thermal sensor internal to the SSD/flash storage is wired through the data connection to the logic board. Inspect SSD/flash storage card data connector and logic board connector for damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 41.		
		No	Go to step 38.		
38.	<p>Reseat SSD/flash storage card to logic board, then retest using MRI/ASD.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Does MRI/ASD still report an SSD/flash storage thermal sensor error (TH1R)?</p>	Yes	Go to step 39.		
		No	Run ASD in OS loop mode to verify that computer does not unexpectedly shut down. Verify issue resolved.		
39.	<p>To troubleshoot this issue completely, a known-good SSD/flash storage card is required.</p> <p>Do you have immediate access to a known-good SSD/flash storage card?</p>	Yes	Go to step 40.		
		No	Replace SSD/flash storage card. Verify issue resolved.	H85	SSD
40.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Substitute a known-good SSD/flash storage card and retest using MRI/ASD.</p> <p>Does MRI/ASD still report an SSD/flash storage thermal sensor error (TH1R)?</p>	Yes	Replace logic board. Reinstall user's SSD/flash storage card. Verify issue resolved.	M23	MLB
		No	Replace SSD/flash storage card. Verify issue resolved.	H85	SSD

	Check	Result	Action	Code	Commodity
41.	<p>Identify whether SSD/flash storage card connector is the only damaged component. Damage to multiple parts will require an escalation to TSPS.</p> <p>Is damaged limited to SSD/flash storage card only?</p>	Yes	Replace SSD/flash storage card. Verify issue resolved.	H85	SSD
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
42.	<p>Ambient thermal sensor failure alone can cause an unexpected shutdown. This sensor monitors incoming airflow to properly cool CPU.</p> <p>Ambient thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u> TA0p - Ambient MLB</p> <p>Does MRI/ASD report an ambient thermal sensor error (TA0p)?</p>	Yes	Replace logic board. Verify issue resolved.	M23	MLB
		No	Go to step 43.		
43.	<p>We have exhausted all external thermal sensors other than those on logic board.</p> <p>MRI thermal sensor names:</p> <p><u>Sensor - MRI Sensor Name</u> TCXr - CPU die TC0p - CPU Proximity TG0d - GPU die TG0p - GPU Proximity TPCD - PCH die TM0p -TM1P-TM2P- TM3p - SO-DIMM Proximity Tm0p - Tm1p-Tm2p - Misc. MLB Proximity Tb0p - BLC Proximity</p> <p>Does MRI/ASD report any of the above thermal sensors as failing?</p>	Yes	Replace logic board. Verify issue resolved.	M23	MLB
		No	Go to step 44.		

	Check	Result	Action	Code	Commodity
44.	<p>Power supply thermal sensor failures can cause an unexpected shutdown. This sensor monitors the power supply secondary heat sink temperature.</p> <p>Power supply thermal sensor name:</p> <p><u>Sensor - MRI Sensor Name</u> TP2h - AC/DC Secondary heat sink</p> <p>Does MRI/ASD report an power supply thermal sensor error (TP2h)?</p>	Yes	Replace power supply. Verify issue resolved.	P02	MLB
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
45.	<p>Run ASD in OS loop mode for 8-10 hours to verify that computer does not unexpectedly shut down.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Kernel Panic / System Crashes

Unlikely causes:


Battery, DisplayPort cable, HDD power cable, LCD panel with glass, left speaker, power supply, rear enclosure, right speaker, stand, Wi-Fi/Bluetooth antenna(s)

Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">Computer displays a kernel panic alert message (see Apple Support article PH11045: OS X Mountain Lion: If “You need to restart your computer” appears.)Computer freezes during useComputer freezes upon wake from sleepComputer freezes when Wi-Fi is enabled or activated <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">Check for and apply latest software and firmware updates. Remember that third party software can contribute to this issue. It may be necessary to check for and apply third party updates that may not appear in the App store.Remove all external devices except for a known-good USB keyboard and mouse, to help rule out peripherals as a possible cause of this issue.Verify memory configuration matches actual amount of installed physical memory.Hold Shift key during startup to put computer into Safe Mode. See Apple Support article HT1564: Mac OS X: What is Safe Boot, Safe Mode?Use OS X Recovery to troubleshoot potential software issues. Hold down Command (⌘) + R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer.Follow steps outlined in Apple Support article TS3742: OS X: About kernel panics.If issue cannot be easily reproduced, run Apple Service Diagnostic (ASD) for longer, looping or OS tests.If the iMac is internally equipped with both a hard drive and a solid state drive (SSD), refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes.


Deep Dive


	Check	Result	Action	Code	Commodity
1.	A voltage, current, or thermal sensor failure or an inoperative fan can cause kernel panics or system crashes. Run Macintosh Resource Inspector (MRI) or consult MRI logs to check for any sensor or fan failures.	Yes	Go to “Intermittent Shutdown” troubleshooting flow.		
		No	Go to step 2.		
	Does MRI report any sensor or fan failures?				

	Check	Result	Action	Code	Commodity
2.	Reset SMC using the procedure for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC) . Then reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. Does computer still experience crashes or kernel panics?	Yes	Go to step 3.		
		No	Issue resolved by SMC/PRAM reset. Verify resolution. This issue could reoccur if the cause is one of the user's external devices that was not brought in with the computer. Advise user to verify computer is functioning properly by initially leaving all external devices detached, then connecting them one at a time to confirm each device's functionality. If this issue reoccurs, the user should document which external devices are attached and bring them with the computer.		
3.	Ask user which USB device(s) are used with computer when crashes or kernel panics occur. Does user have a USB device that may be causing crashes or kernel panics?	Yes	Go to step 4.		
		No	Go to step 5.		
4.	Connect a known-good wired Apple aluminum USB keyboard and wired mouse to user's computer. Disconnect user's USB device(s). Test computer with OS or ASD. Does computer still experience crashes or kernel panics?	Yes	Go to step 5.		
		No	 ESCALATION REQUIRED. Refer to Apple Support article HT1151: USB and FireWire Quick Assist for help with USB devices and USB third-party product support. Contact TSPS for additional support and latest USB device information. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

	Check	Result	Action	Code	Commodity
5.	Connect a known-good Apple wired keyboard and Apple wired mouse to user's computer.	Yes	Go to step 6.		
	<p>Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition.</p> <p>If the iMac is internally equipped with both a hard disc drive (HDD) and a solid-state drive (SSD)/flash storage card, refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes.</p> <p>Does computer still experience crashes or kernel panics?</p>	No	Go to step 26.		
6.	Hold Shift key during startup to put computer into Safe Mode. See Apple Support article HT1564: Mac OS X: What is Safe Boot, Safe Mode?	Yes	Go to step 7.		
	Does computer still experience crashes or kernel panics?	No	Go to step 9.		
7.	Remove installed memory modules and substitute one by one with a known-good memory module.	Yes	Go to step 8.		
	<p>Note: Depending on computer model, this may simply require removal of the rear door, or the removal of LCD display and logic board to access the memory modules.</p> <p>Does computer still experience crashes or kernel panics?</p>	No	<p>Isolate and replace memory module.</p> <p>Note: Only replace a defective memory module. There is no need to replace memory in pairs. Verify issue resolved.</p>	X01	MEMORY
8.	Check logic board memory slots one by one, using a known-good memory module, to isolate a slot-related failure and retest.	Yes	Replace logic board. Reinstall user's memory. Verify issue resolved.	M06	MLB
	<p>Note: Connecting an external display will permit retesting without reinstalling the internal LCD panel.</p> <p>Does crash or kernel panic occur when memory is installed in a specific slot?</p>	No	Go to step 9.		

	Check	Result	Action	Code	Commodity
9.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove wireless card and retest by testing computer with OS or ASD. Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 15.		
		No	Go to step 10.		
10.	<p>Inspect wireless card and logic board connectors for damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 14.		
		No	Go to step 11.		
11.	<p>Reseat wireless card to logic board and retest with OS or ASD.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 12.		
		No	Run ASD in OS loop mode to verify that computer does not unexpectedly shut down. Verify issue resolved.		
12.	<p>To troubleshoot this issue completely, a known-good wireless card is required.</p> <p>Do you have immediate access to a known-good wireless card?</p>	Yes	Go to step 13.		
		No	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE
13.	<p>Substitute a known-good wireless card and retest computer with OS or ASD.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Replace logic board. Reinstall user's wireless card. Verify issue resolved.	M06	MLB
		No	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE



	Check	Result	Action	Code	Commodity
14.	<p>Identify whether wireless card is the only damaged component. Damage to multiple parts will require an escalation to TSPS.</p> <p>Is damaged limited to wireless card only?</p>	Yes	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
15.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Disconnect camera/microphone/ALS cable from logic board or camera (whichever is easiest for you) and retest computer with OS or ASD.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 23.		
		No	Go to step 16.		
16.	<p>Inspect camera, camera/microphone/ALS cable, and logic board connector for damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 22.		
		No	Go to step 17.		
17.	<p>Reseat both ends of camera/microphone/ALS cable and retest computer with OS or ASD.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 18.		
		No	Run ASD in OS loop mode to verify that computer does not unexpectedly crash or kernel panic. Verify issue resolved.		
18.	<p>To troubleshoot this issue completely, a known-good camera/microphone/ALS cable is required.</p> <p>Do you have immediate access to a known-good camera/microphone/ALS cable?</p>	Yes	Go to step 19.		
		No	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
19.	<p>Substitute a known-good camera/microphone/ALS cable and retest computer with OS or ASD.</p> <p>Does computer still experience crashes or kernel panics?</p>	Yes	Go to step 20.		
		No	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE


	Check	Result	Action	Code	Commodity
20.	To troubleshoot this issue completely, a known-good camera is required. Do you have immediate access to a known-good camera?	Yes	Go to step 21.		
		No	Replace camera. Reinstall user's camera/microphone/ALS cable. Verify issue resolved.	X11	OTHER ELECTRIC
21.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good camera and retest computer with OS or ASD. Does computer still experience crashes or kernel panics?	Yes	Replace logic board. Reinstall user's camera and camera/microphone/ALS cable. Verify issue resolved.	M06	MLB
		No	Replace camera. Reinstall user's camera/microphone/ALS cable. Verify issue resolved.	X11	OTHER ELECTRIC
22.	Identify whether camera/microphone/ALS cable is the only damaged component. Damage to multiple parts will require an escalation to TSPS. Is damaged limited to camera/microphone/ALS cable only?	Yes	Replace camera/microphone/ALS cable. Verify issue resolved.	X03	INTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

	Check	Result	Action	Code	Commodity
23.	<p>Mac models may have a hard drive, a solid-state drive (SSD)/flash storage card, or both a hard drive and SSD/flash storage card. If the iMac is internally equipped with both a hard disc drive (HDD) and a SSD/flash storage card, refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes.</p> <p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p>	Yes	Go to step 34.		
	<p>Disconnect hard drive data cable (or SSD/ flash storage card) from logic board. Connect an Ethernet cable and power cord to computer, wait 5 seconds for SMC to become ready, then press power button. Hold down Command-Option-R keys during startup to force restart from OS X Internet recovery.</p> <p>This process may take a few minutes for computer to completely start up, depending on speed of your Internet connection. See Apple Support article HT4718: OS X: About OS X Recovery for more information.</p> <p>Does computer still experience crashes or kernel panics?</p>	No	Go to step 24.		

	Check	Result	Action	Code	Commodity
24.	Mac models may have a hard drive, a solid-state drive (SSD)/flash storage card, or both a hard drive and SSD/flash storage card. If the iMac is internally equipped with both a hard disc drive (HDD) and a SSD/flash storage card, refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. To support Fusion Drive functionality, a known-good HDD and SSD/flash storage card should be used.	Yes	Go to step 28.		
	<p>To completely troubleshoot this issue, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Hard drive or SSD/flash storage card • Hard drive data cable <p>For a Fusion Drive computer, the following known-good parts are required:</p> <ul style="list-style-type: none"> • Hard drive and paired SSD/flash storage card • Hard drive data cable <p>Do you have immediate access to each of these known-good parts?</p>	No	Go to step 25.		
25.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Reconnect hard drive data cable (or SSD/ flash storage card) to logic board.</p> <p>Hold down Command-R during startup to restart from the recovery partition and use Disk Utility to repair user's hard drive or SSD/flash storage card. Retest by exercising computer with OS.</p> <p>Was Disk Utility repair successful and is crash/kernel panic issue resolved?</p>	Yes	Issue resolved after Disk Utility repair. Verify resolution.		
		No	Go to step 26.		
26.	Restore OS X on user's hard drive or SSD/flash storage card. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model.	Yes	Go to step 27.		
	Does computer still experience crashes or kernel panics?	No	Issue resolved after reinstalling OS X. Verify resolution.		

	Check	Result	Action	Code	Commodity
27.	Identify the type of storage device affected: <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage/solid-state drive (SSD) Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage/SSD. Verify issue resolved.	H02	SSD
28.	iMacs equipped with both a hard disc drive (HDD) and a solid-state drive (SSD)/flash storage card ship as a Fusion Drive configuration. Refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012 and later): About Fusion Drive for specific troubleshooting and restore processes. Is computer configured as a Fusion Drive?	Yes	Go to step 33.		
		No	Go to step 29.		
29.	iMac may be equipped with either a hard drive or a SSD/flash storage card. Identify which type of storage device is installed. Is computer equipped with a hard drive or with a SSD/flash storage card?	Hard Drive	Go to step 31.		
		SSD/Flash Storage Card	Go to step 30.		
30.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good SSD/flash storage card with an up-to-date, bootable version of OS X installed. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Does computer still experience crashes or kernel panics?	Yes	Replace logic board. Reinstall user's SSD/flash storage card. Verify issue resolved.	M06	MLB
		No	Replace user's SSD/flash storage card. Verify issue resolved.	H02	SSD
31.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good hard drive with an up-to-date, bootable version of OS X installed. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Does computer still experience crashes or kernel panics?	Yes	Go to step 32.		
		No	Replace user's hard drive. Verify issue resolved.	H02	HDD

	Check	Result	Action	Code	Commodity
32.	Continue using known-good hard drive. Substitute a known-good hard drive data cable between drive and logic board, and retest computer with OS.	Yes	Replace logic board. Reinstall user's hard drive (or/and SSD/flash storage card) and data cable. Verify issue resolved.	M06	MLB
	Does computer still experience crashes or kernel panics?	No	Replace hard drive data cable. Reinstall user's hard drive. Verify issue resolved.	X03	OTHER ELECTRIC
33.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Go to step 32.		
	Substitute a known-good hard drive and SSD/flash storage card paired as a Fusion Drive with an up-to-date, bootable version of OS X installed. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Does computer still experience crashes or kernel panics?	No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
34.	Restart computer from Apple Service Toolkit (AST) server by pressing N key on startup.	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
	Use extended version of Cooling System Diagnostics (CSD) to verify proper function of the following subsystems: <ul style="list-style-type: none"> • SMC • Fan • Thermal sensors • CPU–heat sink thermal interface Does computer pass all CSD checks?	No	Go to step 35.		
35.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.	Yes	Issue resolved by cleaning airflow. Verify resolution.		
	Inspect fan and heat sink fin stack. Partial disassembly of computer is required to access fan and heat sink. Use an ESD-safe vacuum to remove any dust or debris. Reassemble and retest using CSD. Does computer pass all CSD checks?	No	Go to step 36.		

	Check	Result	Action	Code	Commodity
36.	To troubleshoot this issue completely, a known-good fan is required. Do you have immediate access to known-good fan?	Yes	Go to step 37.		
		No	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
37.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Substitute a known-good fan and retest using CSD. Does computer now pass CSD tests?	Yes	Replace fan. Verify issue resolved.	X22	OTHER ELECTRIC
		No	Go to step 38.		
38.	To troubleshoot this issue completely, a known-good logic board is required. Do you have immediate access to a known-good logic board?	Yes	Go to step 39.		
		No	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
39.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components. Continue to use known-good fan. Substitute a known-good logic board. Reassemble computer and retest with MRI and CSD. Do both known-good fan and logic board pass MRI and CSD tests?	Yes	Reinstall user's fan. Replace logic board. Verify issue resolved.	M18	MLB
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
40.	Run ASD in OS loop mode for 8-10 hours to verify that computer does not encounter a crash or kernel panic. Is issue resolved?	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple-part repair.</p> <p>Click Help button in GSX toolbar. Select Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): No Power

Unlikely causes:


Camera, camera/microphone/ALS cable, CPU fan, DisplayPort cable, hard disk drive (HDD), HDD data cable, HDD power cable, LCD panel with glass, left speaker, memory, right speaker, solid state drive (SSD)/Flash storage card, stand, Wi-Fi/Bluetooth antenna(s), wireless card


Quick Check


Symptoms	Quick Check
<ul style="list-style-type: none">• Computer does not power on• No image on internal or external displays• No startup sound• No sounds from fan or hard drive (if hard drive present)• No Caps Lock LED when key is pressed on wired keyboard• Non-operational <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify AC power source.2. Disconnect all peripherals.3. Verify user's power cord.4. Determine whether computer is in power-on state by checking for all of the following:<ul style="list-style-type: none">◦ Caps Lock LED on wired keyboard◦ Fan spinning sound◦ Startup sound◦ Hard drive spin (if hard drive present)◦ Display backlight on or flash◦ External display activity◦ Thunderbolt disk mode operation5. Reset SMC using the procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC) to reset computer to a known power-off state. Try to power on from power-off state.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Attempt normal startup. Press power button to start up computer. Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard.	Yes	Go to step 14.		
	Does computer show any signs of power activity?	No	Go to step 2.		
2.	Inspect user's power cord for wire or connector damage. Also inspect computer AC inlet for signs of arcing or damaged pins, which could affect power cord connections.	Yes	Go to step 3.		
	Did you find any damaged components?	No	Go to step 4.		


	Check	Result	Action	Code	Commodity
3.	<p>Determine whether damage affects user's power cord, AC inlet, or both.</p> <p>Is damage limited to power cord only?</p>	Yes	Replace user's power cord. Verify issue resolved.	X03	EXTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
4.	<p>Verify that user's power cord is securely plugged into a known-good, grounded electrical outlet that provides adequate voltage and power to operate computer. Ensure power cord is fully seated to AC inlet. Attempt to power on computer.</p> <p>Does issue persist after reseating power cord?</p>	Yes	Go to step 5.		
		No	Go to step 14.		
5.	<p>Substitute a known-good power cord and attempt to power on computer.</p> <p>Does issue persist with known-good power cord?</p>	Yes	Go to step 6.		
		No	Replace user's power cord. Verify issue resolved.	X03	EXTERNAL CABLE
6.	<p>Reset SMC using the procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC).</p> <ol style="list-style-type: none"> 1. Press and hold power button a little more than 10 seconds to force SMC to power off computer from an unknown power state. 2. Disconnect power cord and wait 15 seconds with power cord removed to reset SMC. 3. Attach computer's power cord, making sure power button is not being pressed. 4. Wait 5 seconds, then press the power button to turn on computer. <p>Does issue persist after SMC reset?</p>	Yes	Go to step 7.		
		No	Issue resolved. Stuck SMC state prevented computer startup. Verify resolution.		

	Check	Result	Action	Code	Commodity
7.	Remove AC power cord and allow time for power supply to discharge energy before opening computer for repair.	Yes	Go to step 8.		
	Remove LCD panel with glass to inspect and reseal: <ul style="list-style-type: none"> • AC inlet power to power supply • DC power cable between power supply and logic board • Power button cable to power supply Inspect wires and connectors, looking for pinched or exposed wire, and burnt or damaged connectors and pins. Did you find any damaged components?	No	Go to step 9.		
8.	Determine whether damage affects DC power cable only, or additional components such as power supply or logic board connectors. Multiple damaged parts requiring replacement will be a request to TSPS for additional support. Is damage limited to DC power cable only?	Yes	Replace power supply. Verify issue resolved.	P16	POWER SUPPLY
		No	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	P99	
9.	Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button. Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard.	Yes	Go to step 14.		
	CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in. For additional safety information and tips refer to Apple Support articles: <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety Does computer show any signs of power activity?	No	Go to step 10.		

	Check	Result	Action	Code	Commodity
10.	<p>Locate diagnostic LEDs on logic board. With AC power cord connected to computer, verify whether diagnostic LED #1 is on, indicating power supply is providing power to SMC and logic board.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Is diagnostic LED #1 on?</p>	Yes	Go to step 11.		
		No	Replace power supply. Verify issue resolved.	P01	POWER SUPPLY
11.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Disconnect power button cable from power supply to inspect cable and connector for damage. Using a multimeter (set as ohm meter), verify continuity between the two pins of the power button when it is pressed. A properly working power button should be open when button is released.</p> <p>Does power button have continuity when button is pressed and open when released?</p>	Yes	Go to step 12.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Replace the rear housing which includes the power button. Verify issue resolved.</p> <p>Inform user that failures due to accidental damage are not covered by Apple's one-year limited warranty or the AppleCare Protection Plan. Refer to www.apple.com/legal/warranty.</p> <p>Contact TSPS for additional support regarding warranty coverage for this part.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	
12.	<p>Reconnect power button cable to power supply. Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button to start up computer. Verify whether diagnostic LED #2 is on soon after power button is pressed. This indicates that power to start up computer is on.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>Are both diagnostic LED #1 and LED #2 on?</p>	Yes	Go to step 13.		
		No	Replace power supply. Verify issue resolved.	P01	POWER SUPPLY

	Check	Result	Action	Code	Commodity
13.	Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard. Does computer show any signs of power activity?	Yes	Go to step 14.		
		No	Go to step 16.		
14.	Verify whether a video signal appears on display. Is a video image clearly visible on display?	Yes	Run Mac Resource Inspector (MRI) to obtain latest test results. Verify issue resolved.		
		No	Go to step 15.		
15.	On a display with dim or no backlight, shine a bright flashlight onto front of display while carefully checking for a faint image showing graphics, an Apple logo, open windows, or other signs that the system is partially functional. Is any video visible with flashlight?	Yes	Go to “Backlight Issue / No Backlight” troubleshooting flow.		
		No	Go to “Power But Blank / No Video” troubleshooting flow.		
16.	To continue to troubleshoot this issue, a known-good power supply is required. Do you have immediate access to a known-good power supply?	Yes	Go to step 17.		
		No	Go to step 18.		
17.	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Substitute a known-good power supply and attempt to power on computer. Does computer show any signs of power activity?	Yes	Replace power supply. Verify issue resolved.	P01	POWER SUPPLY
		No	Go to step 18.		
18.	Measure the logic board coin battery voltage using one of the procedures listed below: <ul style="list-style-type: none"> • TP911: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Diagnostic LEDs and Test Pads • TP813: iMac (27-inch, Late 2012 and Late 2013): Diagnostic LEDs and Test Pads Carefully touch one multimeter probe to each pad to measure an expected coin battery voltage of 3 volts DC. If the voltage is 2.7 VDC or less, replace the coin battery. Is the coin battery voltage low (less than 2.7 VDC)?	Yes	Replace coin battery. Verify issue resolved.	P12	OTHER ELECTRIC
		No	Go to step 19.		

19.	<p>Important: Remove AC power to computer and wait 2 minutes.</p> <p>Force-reset the logic board Real-Time Clock (RTC) using one of the procedures listed below, and refer to corresponding link for exact location of reset pads for this computer. Be extra careful not to touch any other components to avoid damaging logic board.</p> <p>Caution: Do not short-circuit the reset pads for more than a few seconds, as doing so may cause damage to coin battery and/or logic board.</p> <ol style="list-style-type: none"> 1. Small flat-blade screwdriver: Gently touch flat edge of the tip of the blade to both pads simultaneously. 2. Torx T-10 screwdriver: Holding screwdriver vertically, bridge the flat surface of the tip across both reset pads. 3. Two small metal jeweler's screwdrivers: Touch the tip of each screwdriver to each reset pad, then cross the shanks of the two screwdrivers and touch them together briefly. <ul style="list-style-type: none"> ◦ TP911: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Diagnostic LEDs and Test Pads ◦ TP813: iMac (27-inch, Late 2012 and Late 2013): Diagnostic LEDs and Test Pads <p>Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button. Check computer for any signs of power activity, such as fan or hard drive activity (if hard drive present), startup sound, or Caps Lock LED on wired keyboard.</p> <p>Caution: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013): Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety <p>Does computer show any signs of power activity?</p>	Yes	Issue resolved by resetting logic board. Verify resolution.		
		No	Replace logic board. Verify issue resolved.	M01	MLB

	Check	Result	Action	Code	Commodity
20.	<p>Verify that computer can now complete startup process over multiple trials.</p> <p>Is issue resolved?</p>	Yes	Issue resolved.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	X99	

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Will Not Start Up

Unlikely causes:

Camera, camera/microphone/ALS cable, fan, DisplayPort cable, left speaker, power supply, rear enclosure, right speaker, stand



Quick Check

Symptoms	Quick Check
<ul style="list-style-type: none">• No startup sound or POST (Power On Self-Test)• Gray screen appears during startup• Some video activity, Apple logo, spinning gear• Prohibitory sign or folder with a flashing question mark• Startup chime or error beep tones• Audible fan, hard drive spin (if present) or optical drive reset sounds• Sleep LED on, blinking or went out.• Caps Lock LED on wired keyboard toggles on and off when pressed <p>Note: Inform user that computer failures due to accidental damage are not covered. If applicable, discuss out-of-warranty repair options.</p>	<ol style="list-style-type: none">1. Verify that startup process passes initial memory checks and POST (Power On Self-Test) with a normal startup sound—but no beeping sounds—with some video activity. If computer generates beeping sounds there may be an issue with memory. See Apple Support article HT2341: Intel-based Mac Power On Self Test RAM error codes.2. Disconnect all external peripherals and Ethernet cables.3. Reset SMC using the procedure listed for this computer in Apple Support article HT3964: Intel-based Macs: Resetting the System Management Controller (SMC) to return computer to a known power-off state. Try to power on from power-off state.4. Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. Refer to Apple Support articles HT1379: About NVRAM and PRAM and PH11243: OS X Mountain Lion: Reset your computer's PRAM for more information.5. Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.6. Run Disk Utility or check Mac Resource Inspector (MRI) results to verify presence and SMART status of user's hard drive (HDD) or solid state drive (SSD)/flash storage card. iMac models may have a hard drive or SSD/flash storage card, or both.7. Check Apple Support article HT1159: OS X versions (builds) for computers to make sure system build is correct for this computer model.8. Hold Shift key during startup to put computer into Safe Mode. See Apple Support article HT1564: OS X: What is Safe Boot, Safe Mode?9. Identify when during startup process computer hangs in order to isolate the issue. See Apple Support article HT2674: Intel-based Mac: Startup sequence and error codes, symbols.10. If the iMac is internally equipped with both a hard disc drive (HDD) and a solid state drive (SSD)/flash storage card, refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012): About Fusion Drive for specific troubleshooting and restore processes.

Deep Dive

	Check	Result	Action	Code	Commodity
1.	Reset PRAM by holding down Command-Option-P-R keys while restarting, until you hear the startup sound for the second time. A memory error is indicated by a sequence of one or three beep tones. Refer to Apple Support articles HT2341: Intel-based Mac Power On Self-Test RAM error codes for more information.	Yes	Go to step 2.		
		No	Go to step 16.		
	Does computer make error beep tones at startup?				
2.	Reseat all memory modules securely in their slots and retest.	Yes	Go to step 3.		
		No	Issue resolved. Verify resolution.		
	Does computer make error beep tones at startup?				
3.	iMac (27-inch, Late 2012 and Late 2013) computer models have four memory slots and may have up to four memory modules to test.	Yes	Go to step 7.		
		No	Go to step 4.		
	Does this computer have four memory slots?				
4.	Remove LCD display and logic board to access memory slots. Remove user's memory module from the first slot and substitute a known-good memory module into same slot. Reinstall logic board and LCD display (without VHB foam layers) and retest.	Yes	Go to step 5.		
		No	Replace defective memory. Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple. Verify issue resolved.	X02	MEMORY
	Does computer indicate a memory error with one known-good module and one user module?				
5.	Keep known-good memory module in the first slot and substitute second slot module with a second known-good memory module. Retest.	Yes	Replace logic board. Verify issue resolved.	M07	MLB
		No	Go to step 6.		
	Does computer indicate a memory error using two known-good memory modules?				


	Check	Result	Action	Code	Commodity
6.	Install first user memory module in first memory slot and test with a known-good memory module in second slot.	Yes	Replace both memory modules. Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple. Verify issue resolved.	X02	MEMORY
	Does computer indicate a memory error?	No	Replace defective memory. Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple. Verify issue resolved.	X02	MEMORY
7.	Typical configurations ship with two memory modules located in first two slots. It is possible to see a configuration with four memory modules installed.	Yes	Go to step 8.		
	Is user's computer configured with four memory modules installed?	No	Go to step 13.		
8.	Keep track of where memory is located as you work in pairs to isolate memory and later verify slot functionality. Remove user memory from second two slots and retest.	Yes	Go to step 13.		
	Does computer indicate a memory error with user memory in first two slots only?	No	Go to step 9.		
9.	Leave user memory installed into first two slots. Install two known-good memory modules into second two slots and retest.	Yes	Replace logic board. Verify issue resolved.	M07	MLB
	Does computer indicate a memory error with known-good memory in second two slots?	No	Go to step 10.		
10.	Leave the two installed known-good memory modules in second two slots. Remove user memory from first two slots and set aside as proven good user memory. Install user memory originally removed from second two slots and place this memory into proven good first two slots. Retest.	Yes	Go to step 12.		
	Does computer indicate a memory error with user memory in first two slots?	No	Go to step 11.		


	Check	Result	Action	Code	Commodity
11.	<p>Remove known-good memory from second two slots, leaving user memory (originally from second two slots) in first two slots. Install previously proven good user memory (originally from first two slots) into second two slots. Restart computer to verify user memory that has been reversed from original first two and second two slot configuration.</p> <p>Does computer indicate a memory error with user memory?</p>	Yes	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support. Situation - user memory passes test when paired known-good memory but fails when paired with like user memory.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	
		No	Issue resolved with memory reconfiguration, memory/slot reseal. Verify resolution.		
12.	<p>Remove known-good memory from second two slots, leaving user memory in first two slots. Restart computer to verify user memory in first two slots as standalone with no memory in second two slots.</p> <p>Does computer indicate a memory error with user memory in first two slots only?</p>	Yes	Go to step 13.		
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support. Situation - user memory (currently located first two slots) fails when paired with known-good memory and passes when known-good memory is removed from adjacent slots.</p> <p>Click Help button in GSX toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

	Check	Result	Action	Code	Commodity
13.	<p>Remove user memory module from first slot and substitute a known-good memory module into same first slot. Retest.</p> <p>Does computer indicate a memory error with one known-good and one user module in first two slot?</p>	Yes	Go to step 14.		
		No	<p>Replace defective memory.</p> <p>Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple.</p> <p>Verify issue resolved.</p>	X02	MEMORY
14.	<p>Keep known-good memory module in first slot and substitute second slot module with a second known-good memory module. Keep track of suspect user memory removed from second slot. Testing both first two slots with known-good memory will verify error is defective slots or defective memory.</p> <p>Does computer indicate a memory error using two known-good memory modules in first two slots?</p>	Yes	<p>Replace logic board.</p> <p>Verify issue resolved.</p>	M07	MLB
		No	Go to step 15.		
15.	<p>Install first user memory module (removed from first slot) into second memory slot and test paired with a known-good memory module still in first slot.</p> <p>Does computer indicate a memory error?</p>	Yes	<p>Replace both user memory modules in first two slots.</p> <p>Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple.</p> <p>Verify issue resolved.</p>	X02	MEMORY
		No	<p>Replace defective memory.</p> <p>Note: You may not return non-Apple memory as KBB. Please verify Apple memory using MRI before returning to Apple.</p> <p>Verify issue resolved.</p>	X02	MEMORY
16.	<p>Observe startup process to verify computer at least gets to initial gray screen after startup sound.</p> <p>Does computer reach a gray screen during startup process?</p>	Yes	Go to step 17.		
		No	Go to “Power But Blank/No Video” troubleshooting flow.		


	Check	Result	Action	Code	Commodity
17.	Verify that computer completes full startup process: startup sound > gray screen > Apple logo > spinning gear > login screen > user's desktop. Does computer complete startup process to user's desktop?	Yes	Issue resolved. Verify resolution.		
		No	Go to step 18.		
18.	Start up computer and determine whether a kernel panic is occurring. Refer to Apple Support article PH11045: OS X Mountain Lion: If "You need to restart your computer" appears. Does computer display a kernel panic during startup?	Yes	Go to "Kernel Panic / System Crashes" troubleshooting flow.		
		No	Go to step 19.		
19.	Use OS X Recovery to troubleshoot potential software issues. Hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery. Does computer start up from recovery partition?	Yes	Go to step 20.		
		No	Go to step 23.		
20.	Use a Fusion Drive-capable version of Disk Utility, Mac Resource Inspector (MRI), AST Storage Diagnostic or Apple Service Diagnostic (ASD) to determine whether the user's HDD/SSD/flash storage is recognized, and SMART status is verified. Is user's HDD/SSD/flash storage detected and SMART status verified?	Yes	Go to step 21.		
		No	Go to "Hard Drive/SSD/Flash Storage Not Recognized / Not Mounting / Read-Write Issues" troubleshooting flow.		
21.	If the iMac is internally equipped with both a hard disc drive (HDD) and a solid state drive (SSD)/flash storage, refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012): About Fusion Drive for specific troubleshooting and restore processes. Check Apple Support article HT1159: Mac OS X versions (builds) for computers and use Disk Utility or MRI to determine if the user's HDD/SSD/flash storage has the correct system build for this computer model. Is correct version/build of OS X installed on user's hard drive/SSD/flash storage?	Yes	Go to step 22.		
		No	Restore correct version and build of OS X according to Apple Support article HT1159: Mac OS X versions (builds) for computers . Verify issue resolved.		

	Check	Result	Action	Code	Commodity
22.	Run Disk Utility from the recovery partition to repair the user's HDD/SSD/flash storage. Attempt to start up from the user's HDD/SSD/flash storage. Does computer start up successfully from user's HDD/SSD/flash storage?	Yes	Issue resolved. Verify resolution.		
		No	Restore correct version and build of OS X according to Apple Support article HT1159: Mac OS X versions (builds) for computers . Verify issue resolved.		
23.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.</p> <p>Disconnect hard drive power and data cables at the hard drive. Remove SSD/flash storage card, if present. In order to verify the startup process with the LCD panel removed, connect an external display.</p> <p>Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button. Hold down Command-Option-R keys during startup to force restart from OS X Internet Recovery over NetBoot. See Apple Support article HT4718: OS X: About OS X Recovery.</p> <p>CAUTION: Be extremely careful when working inside the computer while power is applied and system is energized. Avoid touching the logic board or power supply while the computer is plugged in.</p> <p>For additional safety information and tips refer to Apple Support articles:</p> <ul style="list-style-type: none"> • TP820: iMac (27-inch, Late 2012 and Late 2013) Safety • TP914: iMac (21.5-inch, Late 2012, Early 2013, Late 2013) Safety <p>Does computer start up from OS X Internet Recovery?</p>	Yes	Go to step 24.		
		No	Go to step 36.		
24.	To troubleshoot this issue completely, a known-good HDD or SSD/flash storage (depending on computer configuration) is required. Do you have immediate access to a known-good HDD/SSD/flash storage?	Yes	Go to step 25.		
		No	Go to step 28.		
25.	Substitute a known-good HDD/SSD/flash storage. Check Apple Support article HT1159: Mac OS X versions (builds) for computers to make sure system build is correct for this computer model. Does computer start up with known-good HDD/SSD/flash storage?	Yes	Go to step 26.		
		No	Go to step 28.		

	Check	Result	Action	Code	Commodity
26.	<p>If the iMac is internally equipped with both a hard disc drive (HDD) and a solid state drive (SSD)/flash storage, refer to Apple Support article HT5446: Mac mini (Late 2012) and iMac (Late 2012): About Fusion Drive for specific troubleshooting and restore processes.</p> <p>Is user's computer configured with a Fusion Drive?</p>	Yes	Go to step 28.		
		No	Go to step 27.		
27.	<p>Identify the type of storage device affected:</p> <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage/solid-state drive (SSD) <p>Is the affected device an HDD or SSD?</p>	HDD	Replace the user's hard drive. Verify issue resolved.	H02	HDD
		No	Replace the user's flash storage / SSD. Verify issue resolved.	H02	SSD
28.	<p>Reseat and inspect hard drive power cable. Look for damaged wires, and pin or connector housing damage.</p> <p>Did you find any damaged components?</p>	Yes	Go to step 30.		
		No	Go to step 29.		
29.	<p>Identify the type of storage device affected:</p> <ul style="list-style-type: none"> • Hard disk drive (HDD) • Flash storage/solid-state drive (SSD) <p>Is the affected device an HDD or SSD?</p>	HDD	Go to step 31.		
		SSD	Go to step 34.		
30.	<p>Multiple-component damage requires an escalation to TSPS for multipart replacement.</p> <p>Is damage limited to hard drive power cable only?</p>	Yes	Replace hard drive power cable. Reinstall user's hard drive. Verify issue resolved.	X03	INTERNAL CABLE
		No	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>	M99	

	Check	Result	Action	Code	Commodity
31.	With hard drive power cable reseated, power on computer and verify hard drive disc spin-up, listening to disk spindle motor as it spins above 5000 RPMs. Does hard drive seem to be spinning as expected?	Yes	Go to step 32.		
		No	Replace hard drive power cable. Reinstall user's hard drive. Verify issue resolved.	X03	INTERNAL CABLE
32.	To troubleshoot this issue completely, a known-good hard drive data cable is required. Do you have immediate access to a known-good hard drive data cable?	Yes	Go to step 33.		
		No	Replace the user's hard drive. Verify issue resolved.	H02	HDD
33.	Substitute a known-good hard drive data cable and retest. Does computer start up with known-good hard drive data cable?	Yes	Replace hard drive data cable. Reinstall user's hard drive. Verify issue resolved.	X03	INTERNAL CABLE
		No	Go to step 34.		
34.	At this point in the troubleshooting process, you may be using the user's hard drive/SSD/flash storage or a known-good hard drive/SSD/flash storage. Which storage device type is currently installed?	Known-Good HDD/SSD/flash storage	 <p>ESCALATION REQUIRED.</p> <p>Contact TSPS for additional support or a multiple part repair.</p> <p>Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.</p>		
		User's Hard Drive/SSD/flash storage	Go to step 35.		
35.	Identify the type of storage device affected: <ul style="list-style-type: none"> Hard disk drive (HDD) Flash storage/solid-state drive (SSD) Is the affected device an HDD or SSD?	HDD	Replace the user's hard drive. Reinstall user's hard drive data cable. Verify issue resolved.	H02	HDD
		SSD	Replace the user's flash storage/SSD. Reinstall user's SSD data cable. Verify issue resolved.	H02	SSD

	Check	Result	Action	Code	Commodity
36.	<p>Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur. Remember to remove power cord whenever disconnecting modules or substituting cables and components.</p> <p>Remove wireless card from logic board. Reconnect hard drive power and data cables. Reconnect SSD, if present.</p> <p>Connect power cord to computer, wait 5 seconds for SMC to become ready, then press power button. Use Startup Manager or hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.</p> <p>Does computer start up from recovery partition?</p>	Yes	Go to step 37.		
		No	Go to step 42.		
37.	<p>Inspect wireless card edge connector on logic board for bent pins or housing damage.</p> <p>Is logic board connector damaged?</p>	Yes	Replace logic board. Verify issue resolved.	M24	MLB
		No	Go to step 38.		
38.	<p>Inspect wireless card for damage. Verify clean contact on card edge connector, no soot from electrical short, no broken antenna connections, proper heat transfer pad attached, and a flat surface overall. Confirm no bending or broken printed circuit board or EMI shield.</p> <p>Is wireless card damaged?</p>	Yes	Replace the wireless card. Verify issue resolved.	N17	WIRELESS DEVICE
		No	Go to step 39.		
39.	<p>Reseat wireless card connection to logic board.</p> <p>Use Startup Manager or hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery.</p> <p>Does computer start up from recovery partition?</p>	Yes	Issue resolved by reseating wireless card. Verify resolution.		
		No	Go to step 40.		
40.	<p>To troubleshoot this issue completely, a known-good wireless card is required.</p> <p>Do you have immediate access to a known-good wireless card?</p>	Yes	Go to step 41.		
		No	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE

	Check	Result	Action	Code	Commodity
41.	Substitute a known-good wireless card.	Yes	Replace wireless card. Verify issue resolved.	N13	WIRELESS DEVICE
	Use Startup Manager or hold down Command-R during startup to restart from the recovery partition. See Apple Support article HT4718: OS X: About OS X Recovery .	No	Replace logic board. Reinstall user's wireless card. Verify issue resolved.	M02	MLB
	Verify that Wi-Fi is present.				
42.	Does computer start up from recovery partition?	No	Go to step 43.		
	Important: Ensure that user's computer is shut down, then remove power cord and wait two minutes for self discharge to occur.				
	Use multimeter to measure backup battery coin cell voltage at logic board test points TP2600 and TP2601, to determine whether replacement is needed. A good battery should be above 2.7 volts.				
43.	Is coin battery below 2.7 volts?	No	Go to step 44.		
	Locate logic board test points TP2602 and TP2603.				
	Briefly short these two test points together using the tip of a flat blade screwdriver. This resets the computer's Real-Time Clock (RTC). Apply AC power and attempt to start up with a known-good coin battery.				
44.	Does computer make a startup sound?	No	Replace logic board. Verify issue resolved.	M02	MLB
	Verify that computer completes full startup process: startup sound > gray screen > Apple logo > spinning gear > login screen > user's desktop.				
	Does computer complete startup process to user's desktop?				
45.	Verify that computer can now complete startup process over multiple trials. Is issue resolved?	Yes	Issue resolved.		
		No	 ESCALATION REQUIRED. Contact TSPS for additional support or a multiple part repair. Click the Help button in the GSX Toolbar then choose Troubleshooting > Technical Help with a Repair > Contact Apple.	X99	

Becoming Qualified for iMac (21.5-inch, Late 2012, Early 2013 and Late 2013) and iMac (27-inch, Late 2012 and Late 2013) Repairs

Overview

In order to service any of these products:

- iMac (21.5-inch, Late 2012)
- iMac (27-inch, Late 2012)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2013)
- iMac (27-inch, Late 2013)

Technicians must pass this ONE qualification exam in addition to the ACMT certification:

- iMac (Late 2012, Early 2013, Late 2013) Qualification Exam (9L0-S04)
Note: Passing this one exam will qualify technicians to service all of the models listed above.

This requirement ensures technicians will service these models correctly and provide users with the best possible experience.

Important

- Technicians who have passed any previous version of the 9L0-S04 exam will be automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). They do NOT need to retake the exam.
- Although there is no need to retake the exam, technicians are expected to review the updated service training course, iMac (Late 2012, Early 2013 and Late 2013), before attempting an iMac (Late 2013) repair.

Exam Preparation

The exam is based on one online course provided by AppleCare:

- [iMac \(Late 2012, Early 2013, Late 2013\)](#)

Review the course before attempting the exam. It is recommended that you have the course available to you when taking the exam. Looking up specific information is permitted.

Exam Instructions

The AppleCare iMac (Late 2012, Early 2013, Late 2013) Qualification Exam (9L0-S04) is available from Pearson VUE:

- <http://www.pearsonvue.com/apple>

In either case, the exam costs \$15 US and is payable by credit card. The exam is open book and requires an overall score of at least 80% to pass.

Important: You must score 90% or higher in the Technician Safety section of the exam to pass. If you score lower than 90% in this section, you will fail the whole exam regardless of your performance in other sections.

Questions

Questions about the exam or online courses can be addressed to svc.trng@apple.com.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Required Tools

Required Tools

The following tools are required to service an iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013):

- ESD-safe workstation, including an ESD mat and wrist or heel strap
- ESD bags (to store ESD-sensitive parts while removed from computer)
- Starter Kit, LCD Display Panel, 076-1444, iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013)
- Display Refill Kit, Very High Bond, VHB, 6-piece set, 20-pack, 076-1419, iMac (27-inch)
- Display Refill Kit, Very High Bond, VHB, 6-piece set, 20-pack, 076-1437, iMac (21.5-inch)
- Service Foam Locking Wedge, iMac (part of starter kit, 076-1444, not available separately)
- Magnetized Torx T25 screwdriver (27-inch, Late 2012, Late 2013 models)
- Magnetized Torx T10 screwdriver
- Magnetized Torx T8 screwdriver
- Magnetized Torx T6 screwdriver
- Magnetized Torx T5 screwdriver
- Magnetized Torx T4 screwdriver
- Phillips #00 screwdriver
- Pentalobe Driver, for VESA mount (923-0367)
- Black stick (nylon probe, Apple part #922-5065) or other non-conductive nylon or plastic flat-blade tool
- Thunderbolt and USB cables for logic board reassembly
- Earphones for audio cable reassembly
- Thermal material (twinpak) Kit, 076-1425 (see Important note below)
- Thermal Pad Kit, 076-1445
- Display cable extension kit, 076-1428, iMac 21.5-inch (for testing the panel and cables with the panel off)
- Display cable extension kit, 076-1431, iMac 27-inch (for testing the panel and cables with the panel off)
- Power supply protective covers, 923-0189, (use when performing live adjustments with the panel off)
- Kapton tape
- Painter's tape (tape that does not leave a residue, 1- 2-inches wide, but preferably 2-inch, if available)
- IPA wipes, 95% or higher isopropyl
- Magnifying glass, for reading serial number etched on bottom of stand
- Digital volt meter (for troubleshooting)
- Soft, clean towel or cloth (to protect display and removed parts from scratches)
- Sticky (Post-it) notes

Note: Beginning July 17, 2013, a new thermal pad kit replaces the original twinpak of thermal material (076-1425) necessary for installing wireless cards in iMac (Late 2012, Early 2013) models. The new thermal pad kit is included with wireless card and logic board replacement parts, and is also available separately (076-1445). If your packet of thermal material (076-1425) has not expired, you may use it; however, it's much easier, cleaner, and quicker to install a thermal pad.

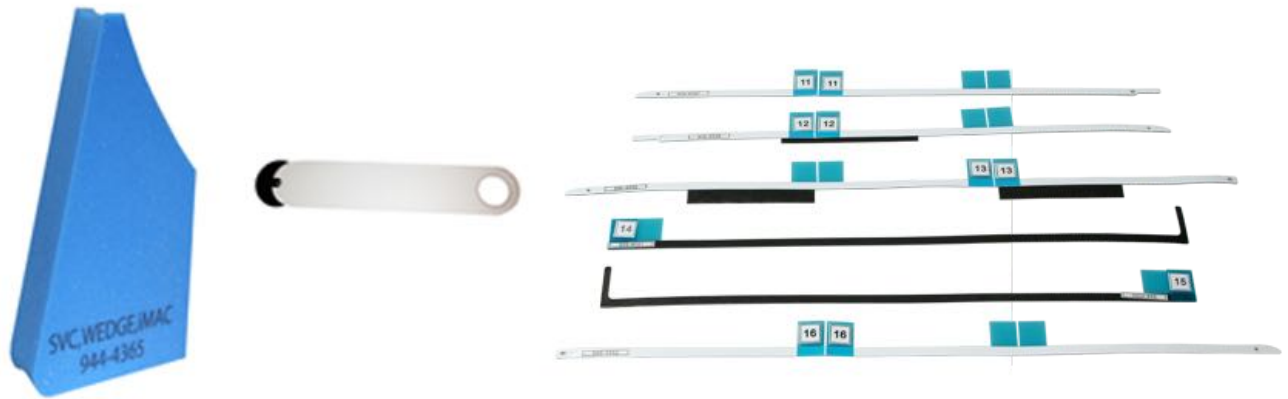
Whenever you remove or replace the wireless card in an iMac (Late 2012, Early 2013), check for a dollop of original thermal material. If present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.

Required Special Tools and Supplies for Display Panel

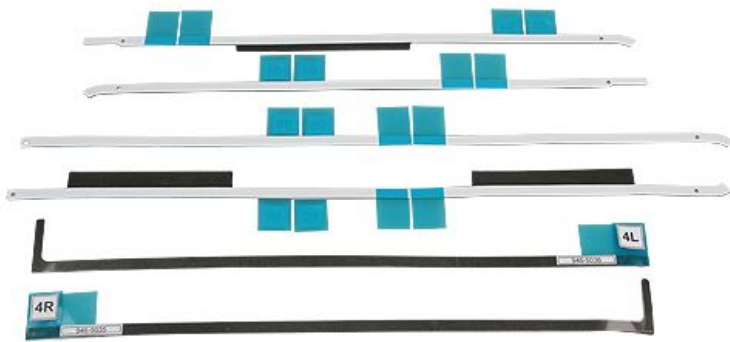
The display is secured to the rear enclosure using adhesive strips. When a repair requires the removal of the display panel, the Very High Bond (VHB) adhesive strips must be cut and replaced.

The display removal procedure requires these special tools:

- iMac Service Foam Locking Wedge
- Display removal wheel
- Display removal handle
- Very High Bond (VHB) adhesive strips (iMac 27-inch VHB and iMac 21.5-inch shown below)



iMac (21.5-inch) VHB strips



- 076-1444 – Starter Kit, LCD Display Panel
 - Handle, display removal tool (1)
 - Display removal wheel (8)
 - Very High Bond (VHB) adhesive strip 6-piece set for iMac (27-inch, Late 2012, Late 2013) (4 sets)
 - Very High Bond (VHB) adhesive strip 6-piece set for iMac (21.5-inch, Late 2012, Early 2013, Late 2013) (4 sets)
 - iMac Service Foam Locking Wedge
- 076-1419 – Display Refill Kit, iMac (27-inch, Late 2012, Late 2013)
 - Display removal wheel (20)
 - Handle, display removal tool, iMac (1)
 - Very High Bond (VHB) adhesive strip 6-piece set (20)
- 076-1437 – Display Refill Kit, iMac (21.5-inch Late 2012, Early 2013, Late 2013)
 - Display removal wheel (20)
 - Handle, display removal tool, iMac (1)
 - Very High Bond (VHB) adhesive strip 6-piece set (20)
- 922-9468 – ESD bags, 24"x30", Pkg of 5. To prevent buildup of static charges which may attract dust particles, store LCD panel in an ESD bag when it is removed from unit.
- 922-8258 – ESD bags that will accommodate a 27" display, Pkg of 5
- 922-8259 – Microfoam bag to store display panel, Pkg of 5
- 922-8261 – Sticky silicone roller (6-inch) to adhere VHB strips to the display panel
- 922-8262 – Sticky sheet pads to clean silicone roller / pick up shards of broken glass
- 922-8263 – Polishing cloths, anti-static, optical-grade micro-terry, Pkg of 5
- IPA wipes, 95% or higher isopropyl
- Painter's tape (tape that does not leave a residue, 1- 2-inches wide, but preferably 2-inch, if available)

LCD Support Stand for iMac Repair

Use the corrugated stand to support the LCD panel during an iMac repair or when working on a VESA mount adapted system.

- LCD Service Support Stand (923-0416)



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Safety



High Voltage Warning: Use extreme caution when troubleshooting with the display panel removed. Avoid touching the logic board or power supply while the computer is plugged in because the power supply retains a charge whether or not the computer is on. Before working on or near the power supply, unplug the power cord from the computer and wait at least two minutes for the electricity to discharge.

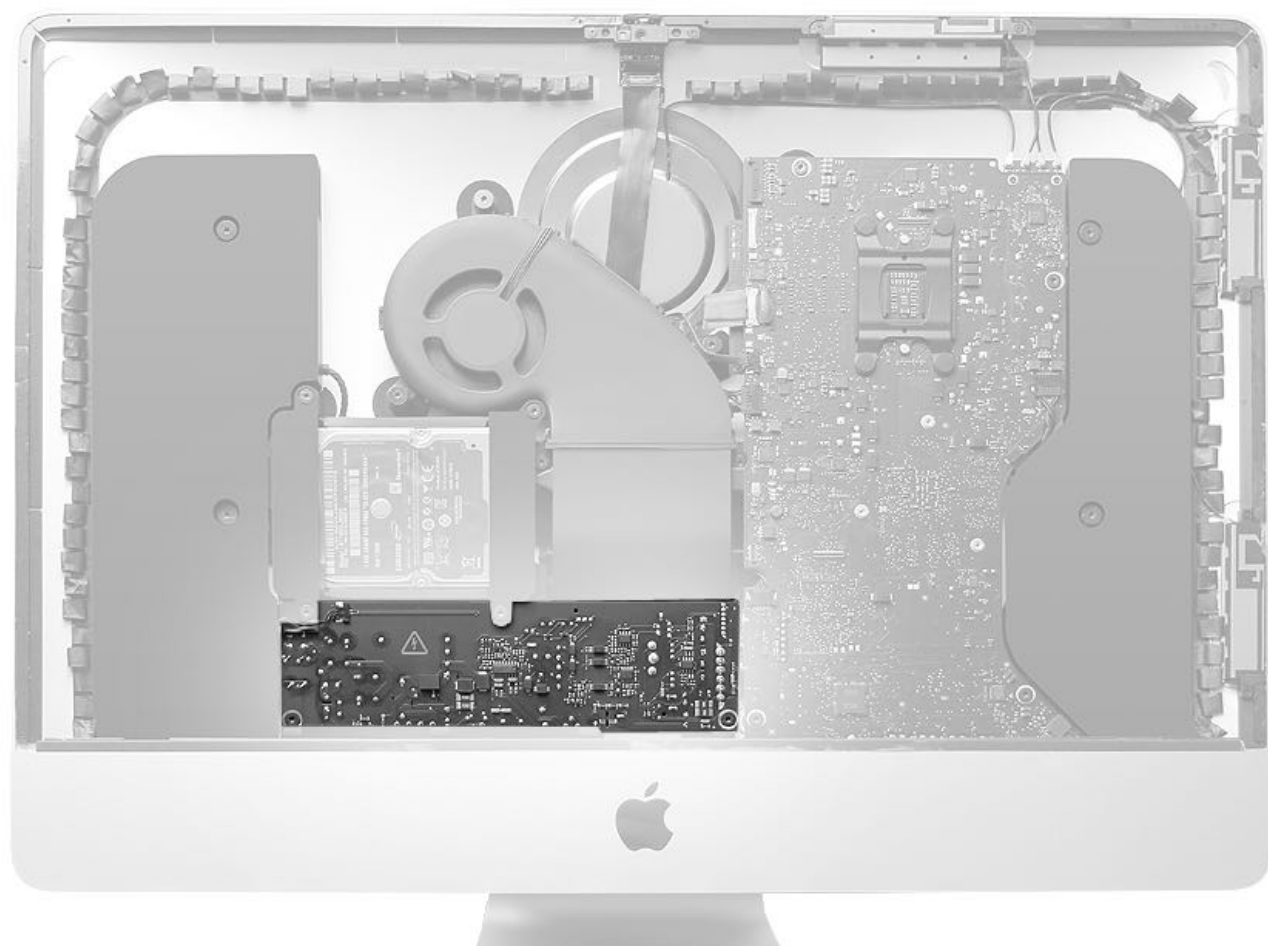
- Never remove or install any physical components while the computer is plugged in to an electrical outlet.
- When plugged in, the power supply and logic board are energized, even when the computer is powered off.
- Unplug computer and, when possible, allow sufficient time for the power supply and logic board to self-discharge before removing display panel.
- Do NOT touch the logic board or power supply while the computer is plugged in, or before sufficient time has passed to discharge stored voltage to a safe level after being unplugged.

Warning: After unplugging the computer from the electrical outlet, wait **two** minutes before removing display panel, disconnecting modules or substituting cables and components. This will allow the power supply and logic board time to discharge.

Electrical Safety Precautions

Before working on a computer with exposed, potentially energized parts:

1. **Remove rings, watches, necklaces, metal-rimmed eyewear, and other metallic articles** which increase your risk of electric shock.
2. **Do not wear a cell phone or other signaling device**, as these may cause a dangerous startle reflex during energized work.
3. **If the iMac needs to be plugged in for LED checks or similar troubleshooting, do NOT wear an ESD wrist strap.** Wearing ESD grounding systems increases your risk of electric shock.
4. **Remain alert**, focused on the work being performed, and aware of the proximity of grounded objects to your body.
5. **Use the plastic black stick or other non-metal extension tool as needed** to connect or disconnect cables, to keep fingers away from potentially energized parts.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013): Cleaning and Handling a Broken Display Panel

Tools for Cleaning the Display Panel

- Safety glasses
- Service wedge, iMac (included with the Display panel starter kit, 076-1444)
- Clean, damp cloth (to clean display panel glass)
- Isopropyl Alcohol (IPA) wipes (to remove residual VHB adhesive)

Cleaning the Display Panel

1. Clean the front of display with a clean, damp, lint-free cloth. **Note:** IPA wipes should only be used to remove residual VHB adhesive.
2. Polish the display panel with an anti-static, micro-terry, optical-grade, polishing cloth (922-8263, Pkg of 5).



Glass Safety Precautions

The iMac (21.5-inch, Late 2012, Early 2013, Late 2013) and iMac (27-inch, Late 2012, Late 2013) have a glass display panel that attaches to the front of the computer, which must be removed to access internal components.

Handling a Broken Display Panel

- The display panel's glass is not tempered and will break into sharp pieces if mishandled. Removing the display panel requires special tools.
- Safety glasses are recommended when removing the display panel.

Tools

- Display panel starter kit, 076-1444
- Leather gloves or equivalent cut-resistant gloves
- Packing tape or equivalent
- Safety glasses
- Large ESD bags, 922-8258 – bags that will accommodate a 27" display, Pkg of 5

- Large box for disposal

Safety Information



If for some unforeseen reason, a glass shard enters the eye:

- Seek medical attention immediately!
- Do not rub your eye if you feel you have something in your eye.
- Do not use an eye wash. An eye wash can push or move the shard of glass and cause more damage.
- Keep eye closed or even loosely patch the eye to keep eye from moving.



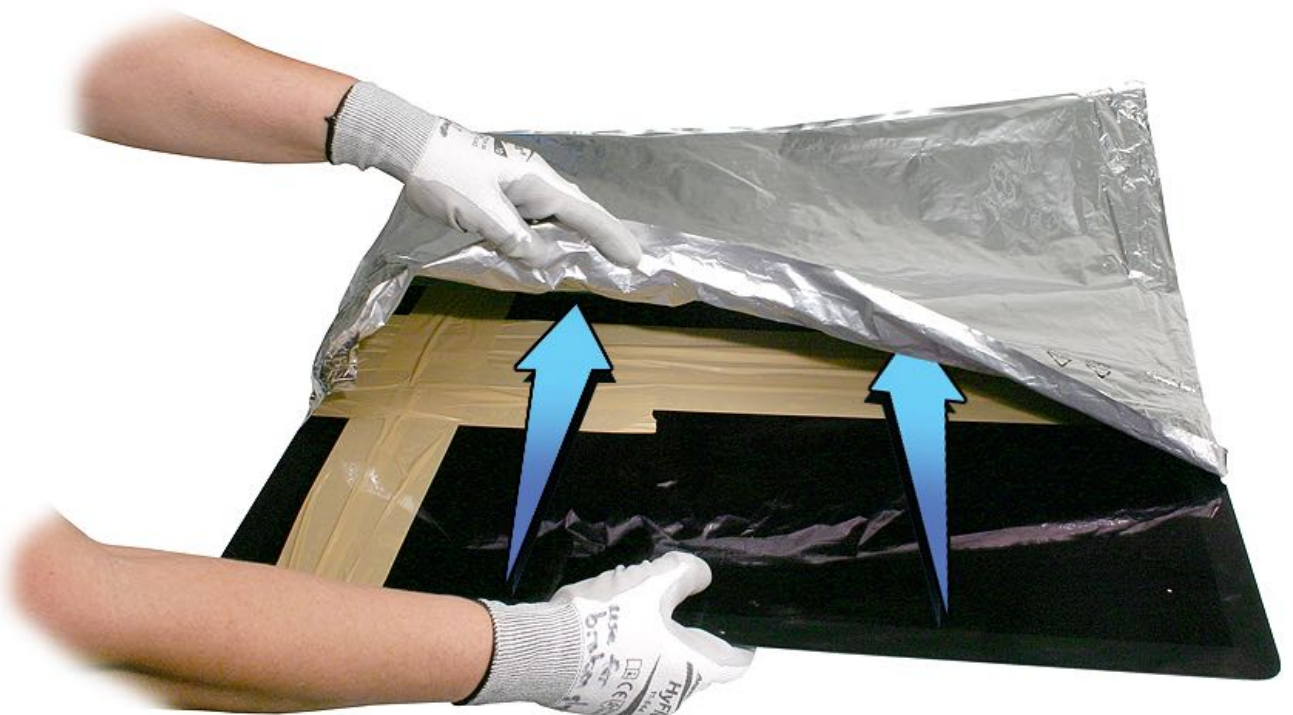
Handling a Broken Display Panel

1. Put on safety glasses and leather gloves.
2. If the display panel is broken, and attached to the rear housing, secure the broken glass with packing tape, and carefully follow the Display Panel Removal procedure.
 - [iMac \(21.5-inch, Late 2012, Early 2013, Late 2013\): Display Panel Removal](#)
 - [iMac \(27-inch, Late 2012, Late 2013\): Display Panel Removal](#)
3. Lay the display panel on a smooth, clean work surface.
4. Apply tape, thoroughly covering the broken display panel.



4.

5. Place taped display panel in the ESD bag that the replacement panel came in (or equivalent large bag).



6. Place the display panel inside a large box, label the box "Broken Glass", and return the display back to Apple using the normal return process.



Take Apart Procedure Notes

Reassembly Steps

When no replacement steps are listed, replace parts in exact reverse order of Removal procedure.

Note About Images in This Guide

In some cases a pre-production model may have been used to document the procedures in this guide. Although there may be small differences in appearance between the image pictured and the computer you are servicing, the procedures are the same unless noted.

Screw Sizes

All screw sizes shown are approximate and represent the total length of the screw.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Display Panel Removal

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013, and Late 2013\) Repairs](#).

For video instruction, refer to Apple Support article [SV116: Display Panel Removal Video](#).

Before you begin:

- Shut down computer.
- Unplug power and disconnect peripherals.
- Put on an ESD wrist strap.



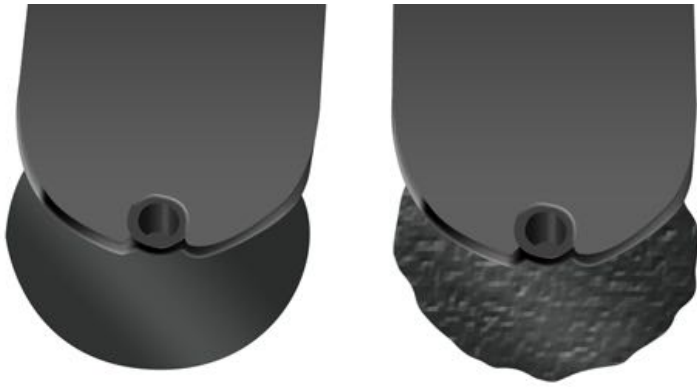
Tools

- ESD wrist strap and mat
- ESD-safe bag
- Black stick
- Display removal tool
- Replacement wheels for display removal tool (several)
- Safety glasses
- Service wedge, iMac



The display panel must be removed for all repairs. The display is affixed to the computer housing with very high bond (VHB) adhesive strips. These VHB strips must be cut with the display removal tool in order to remove the LCD panel. Each VHB strip consists of two adhesive layers and a foam layer (VHB/foam/VHB). When you remove the display, you're cutting primarily through the foam layer.

The primary tool is the display removal tool. The tool has replaceable wheels that cut through the foam layer in the VHB strips. These wheels are one-time use. Replace the wheel after each use or if it becomes damaged.



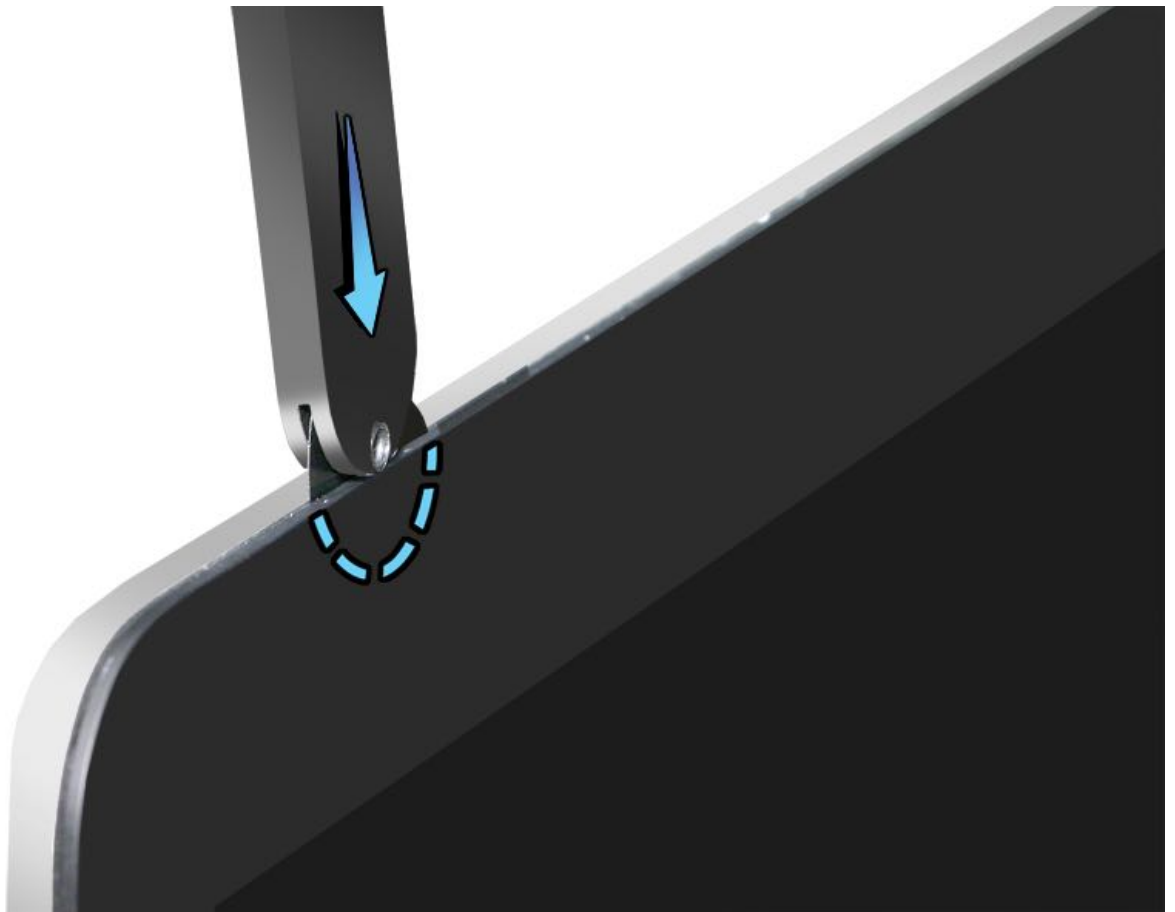
Steps For Removal

Note: In the unlikely event that the display glass cracks or breaks, refer to [TP819: Cleaning and Handling the Display Panel](#).

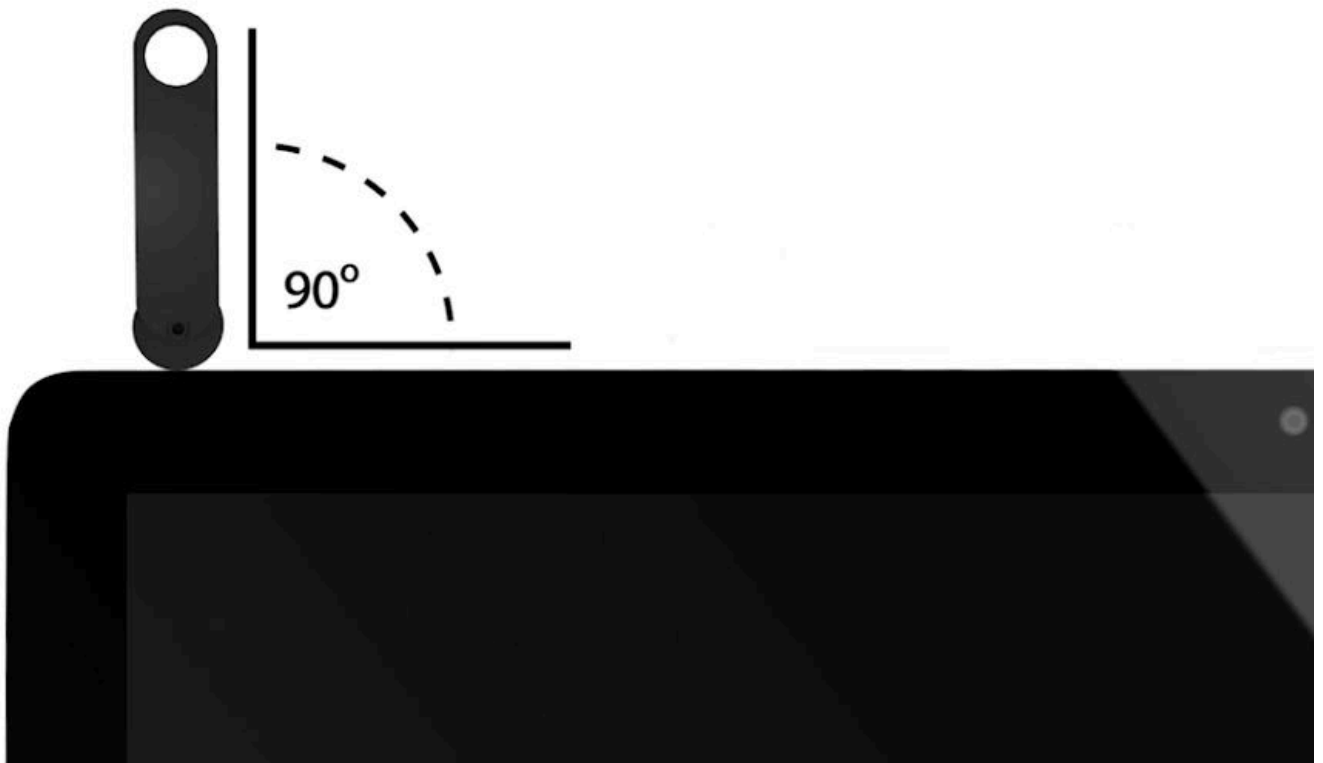
1. Use the service wedge to hold the display steady. When positioned correctly, it covers the power receptacle. Rotate the computer so the display panel is facing you.



2. Starting on the left side of the display, insert the display removal tool firmly between the display and the computer housing.



3. Hold display removal tool perpendicular (at a 90-degree angle) to the edge.



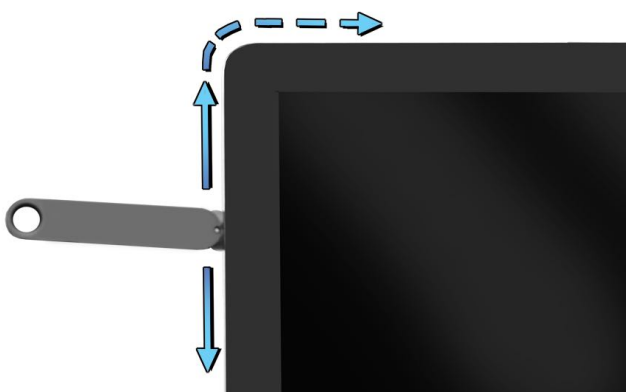
4. Roll the display removal tool back and forth in short increments along the top and sides of the display panel. **Note:** As there is no VHB adhesive at the top center, where the camera is, there is no need for a continuous swipe across the top.

Pay special attention to the top corners as the tool must make steady contact with the display and housing.



5. Continue to move the display removal tool until it moves with minimal resistance. Roll the tool back and forth multiple times along top (except in camera location) and sides of the display panel to cut through the VHB. Repeat the procedure until the tool moves with minimal resistance.

Important: If you just do one swipe with the display removal tool, you won't cut through the foam and it will be almost impossible to remove the display off the rear housing.





6. Use the flat end of a black stick to gently remove any remaining VHB.

CAUTION: Forcing the black stick between the display panel and the enclosure may cause the display panel to fracture.



Important: Pay special attention to the right side of the display panel. The WiFi and Bluetooth antennas have VHB on them and are out of the display removal tool's reach. **Do not pry** with the black stick.



7. Use a black stick and your fingers to separate the display panel from the rear housing. If there is resistance, you need to remove more VHB. **Do not pry up** with the black stick.

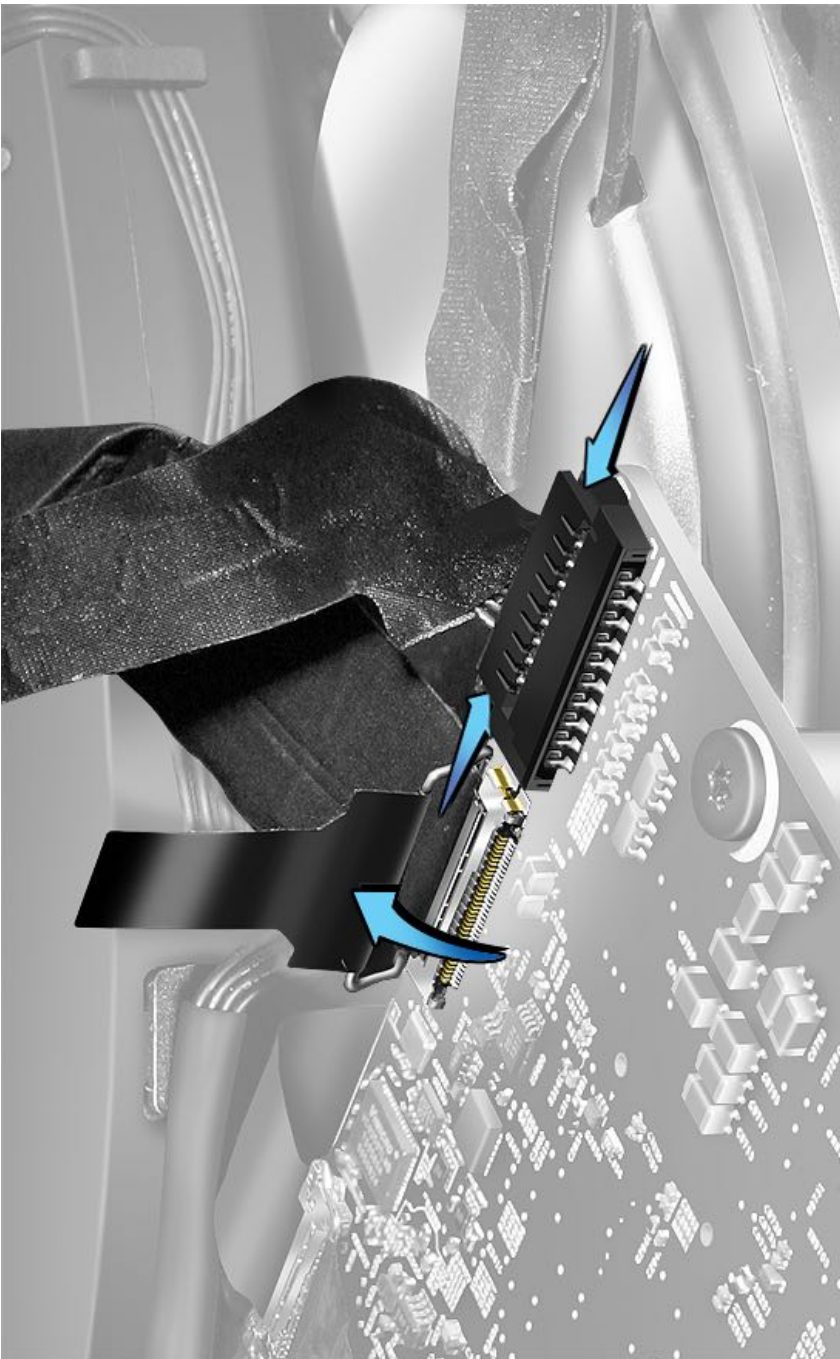


8. Tilt the display open slightly, just enough to for your hand to reach the cables connecting the display to the logic board. Be careful not to put stress on the display cables or connectors while tilting the display open. Keep in mind that the bottom edge of the display is still attached with VHB.

DO NOT yet remove the display panel.



9. Disconnect the display power cable from the logic board by pinching the sides and pulling the power cable straight out of its connector. Remove the embedded DisplayPort (eDP) cable from the logic board by moving the locking lever back and pulling the cable straight out of its connector.



10. Tilt the display down.



11. Use a black stick or the display removal tool as needed to loosen any remaining VHB along bottom edge.

Note: Gently lift the display panel off of the rear housing and use an ESD-safe bag to store it.



Steps For Reassembly

See the following articles:

- [RP1022: Display Panel - Removing Very High Bond \(VHB\) Strips](#)
- [RP1023: Display Panel - Replacing Very High Bond \(VHB\) Strips](#)
- [RP1024: Display Panel Reassembly](#)

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Display Panel - Removing Very High Bond (VHB) Strips

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

For video instruction, refer to Apple Support article [SV102: VHB Removal Video](#).

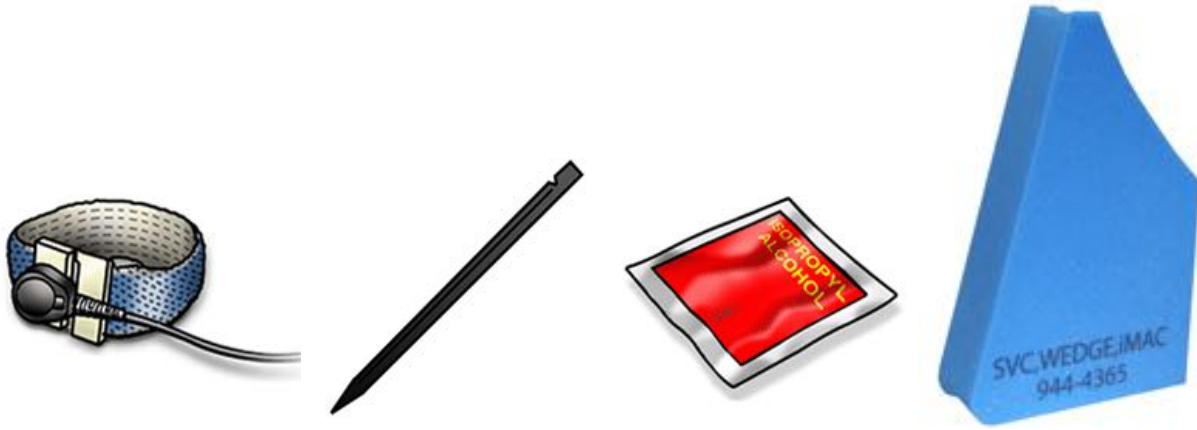
Before you begin:

- [Display Panel Removal](#)



Tools

- ESD wrist strap and mat
- Black stick
- Isopropyl alcohol (IPA) wipes
- Service wedge, iMac



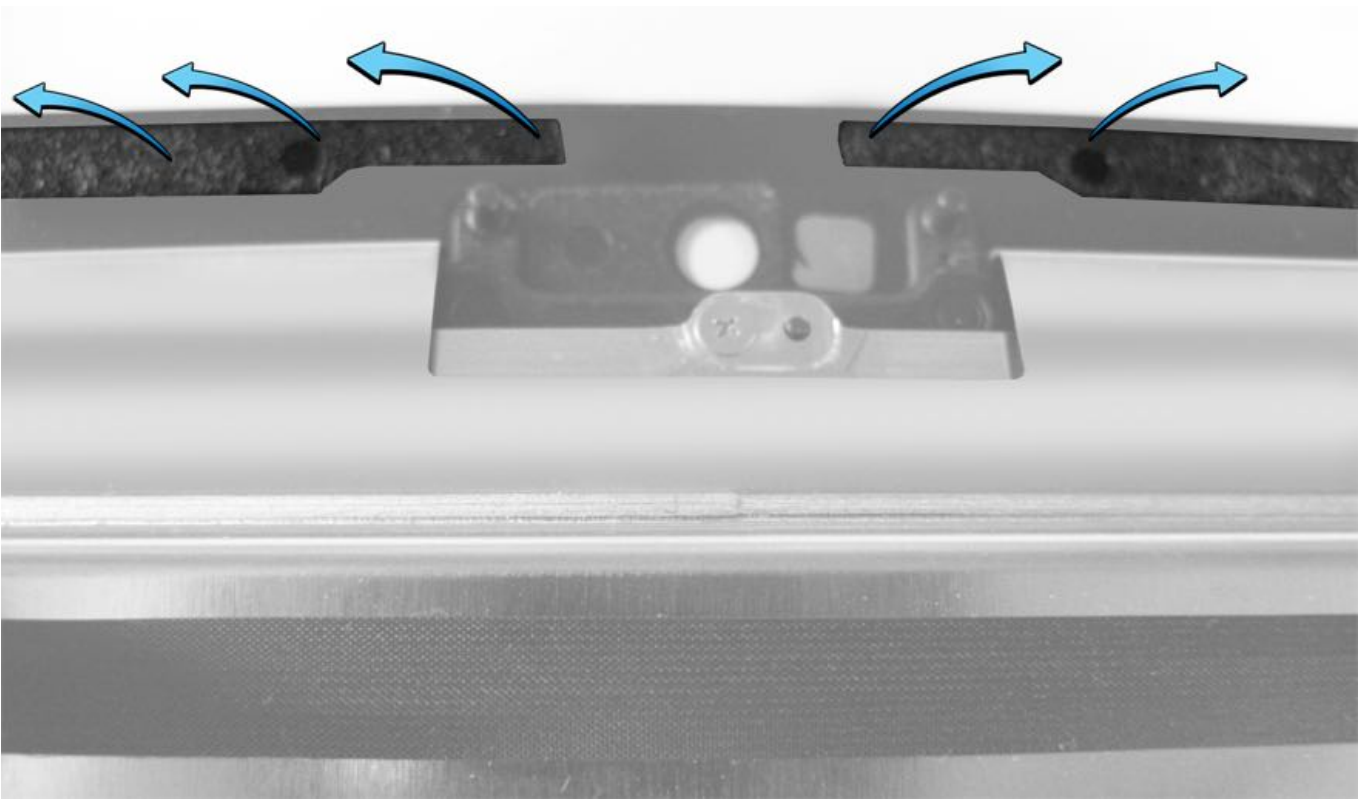
Steps For Removal

1. Use fingers and the flat end of a black stick to remove any residual VHB from the rear housing and display panel.

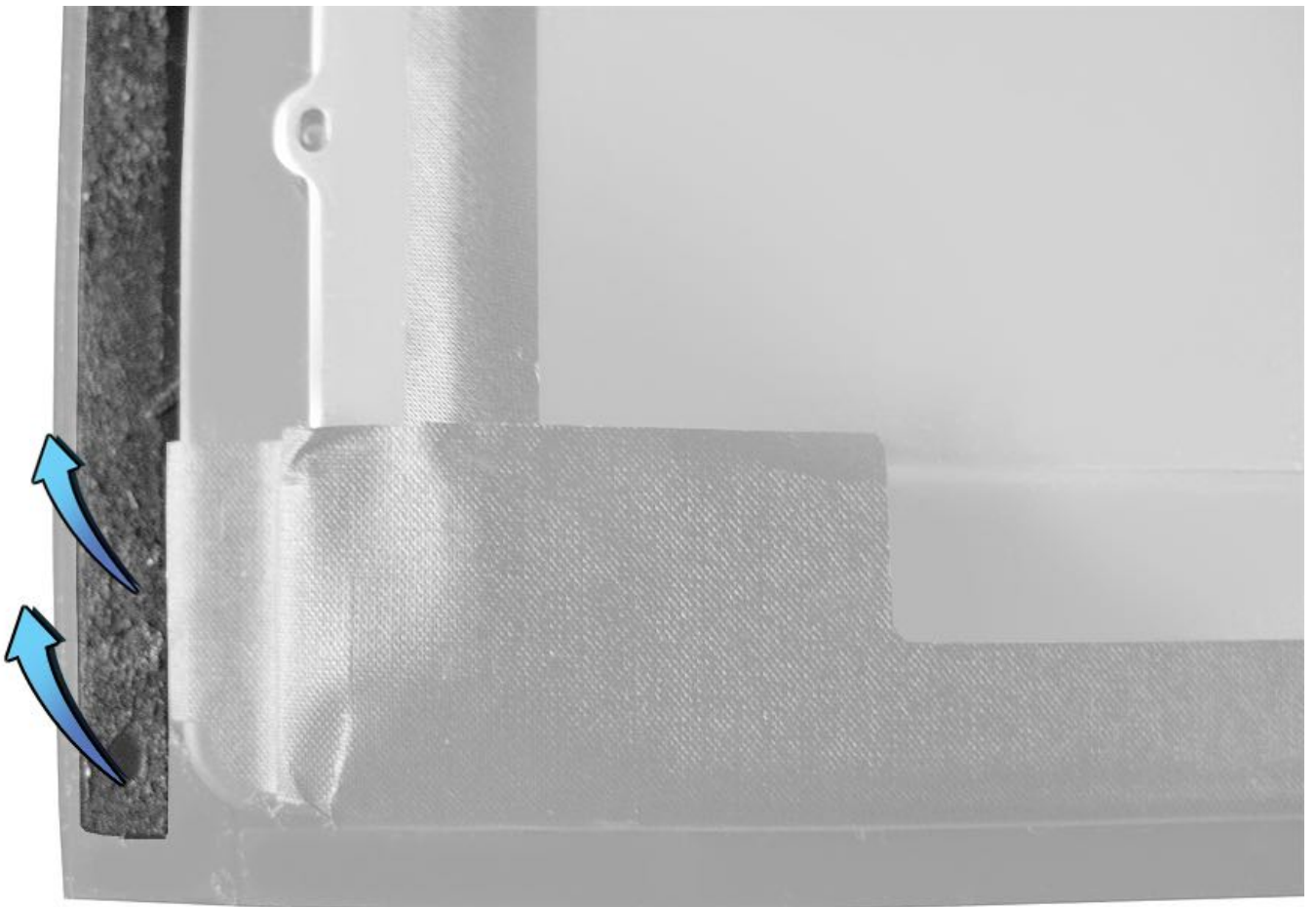


Caution: Be careful when removing VHB from the display panel. Prevent damage to the black mylar protective film that is located on the display panel glass. Ensure that you are peeling up the VHB and **not** the mylar. An easy way to ensure you don't peel up the mylar on the display is to start peeling the VHB from the center point at the top of the display and not from the corners of the display.

Top of display shown, peel VHB to the left and right, above the camera module location.



At the bottom corners of the display, peel VHB upward.



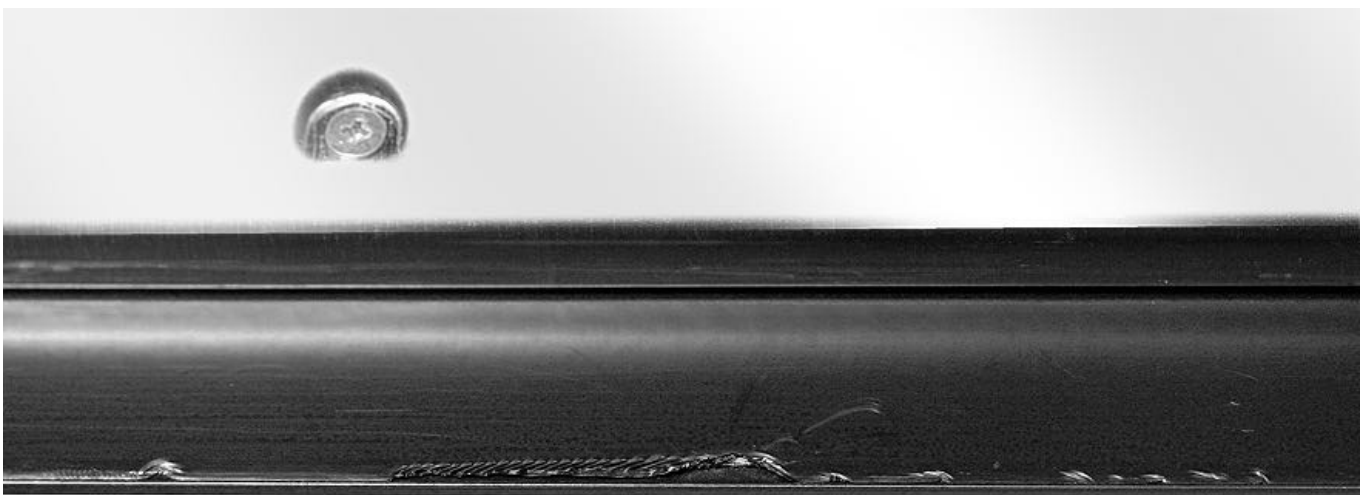


Note: If the mylar is pinched or scratched (like the one shown below) simply press the mylar back down with your finger or a black stick. The mylar should be smooth and undamaged. Use caution when working around the black mylar protective film. If the black protective mylar is pulled from the display then the display panel may need to be replaced.

Don't peel VBH from display corners. The chance of damaging the black mylar protective film is greater if VHB removal is started in the corner.



Damaged black protective mylar shown pulled away from the display panel.

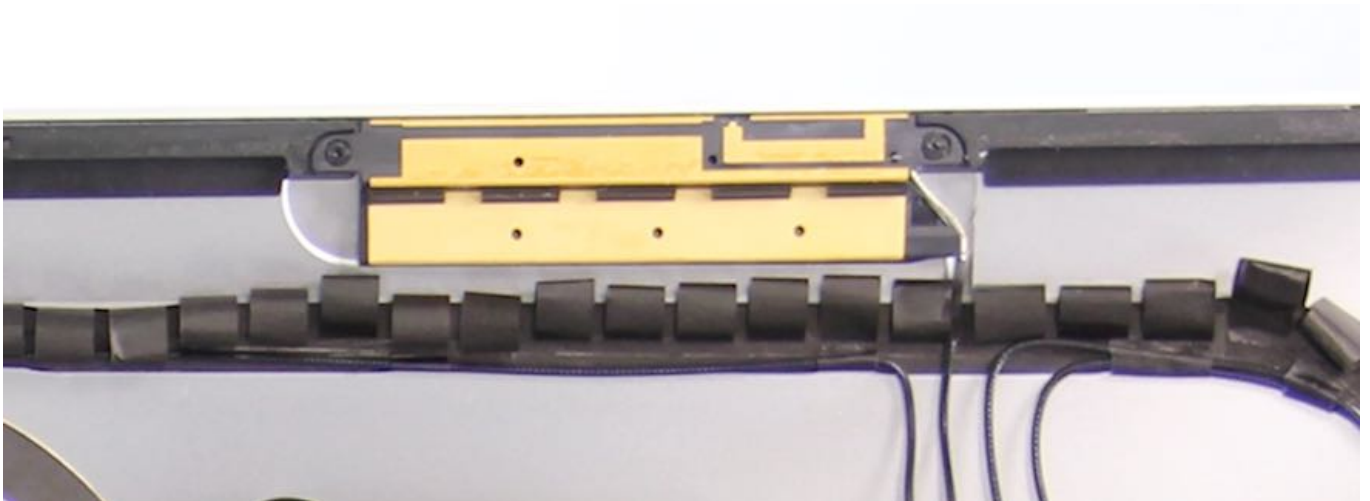


2. Clean residual VHB adhesive with an alcohol wipe. Be sure to remove all traces of old VHB or the new VHB strips will not adhere correctly. Allow surfaces to dry for one (1) minute.

Caution: Do not press overly hard and torque the rear housing on its stand while cleaning the VHB adhesive residue.



3. Check carefully that the rear housing, display panel, and Wi-Fi/Bluetooth antennas are free from VHB material and adhesive residue.



Steps For Reassembly

See the following articles:

- [RP1023: Display Panel - Replacing Very High Bond \(VHB\) Strips](#)
- [RP1024: Display Panel Reassembly](#)

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Display Panel - Replacing Very High Bond (VHB) Strips

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

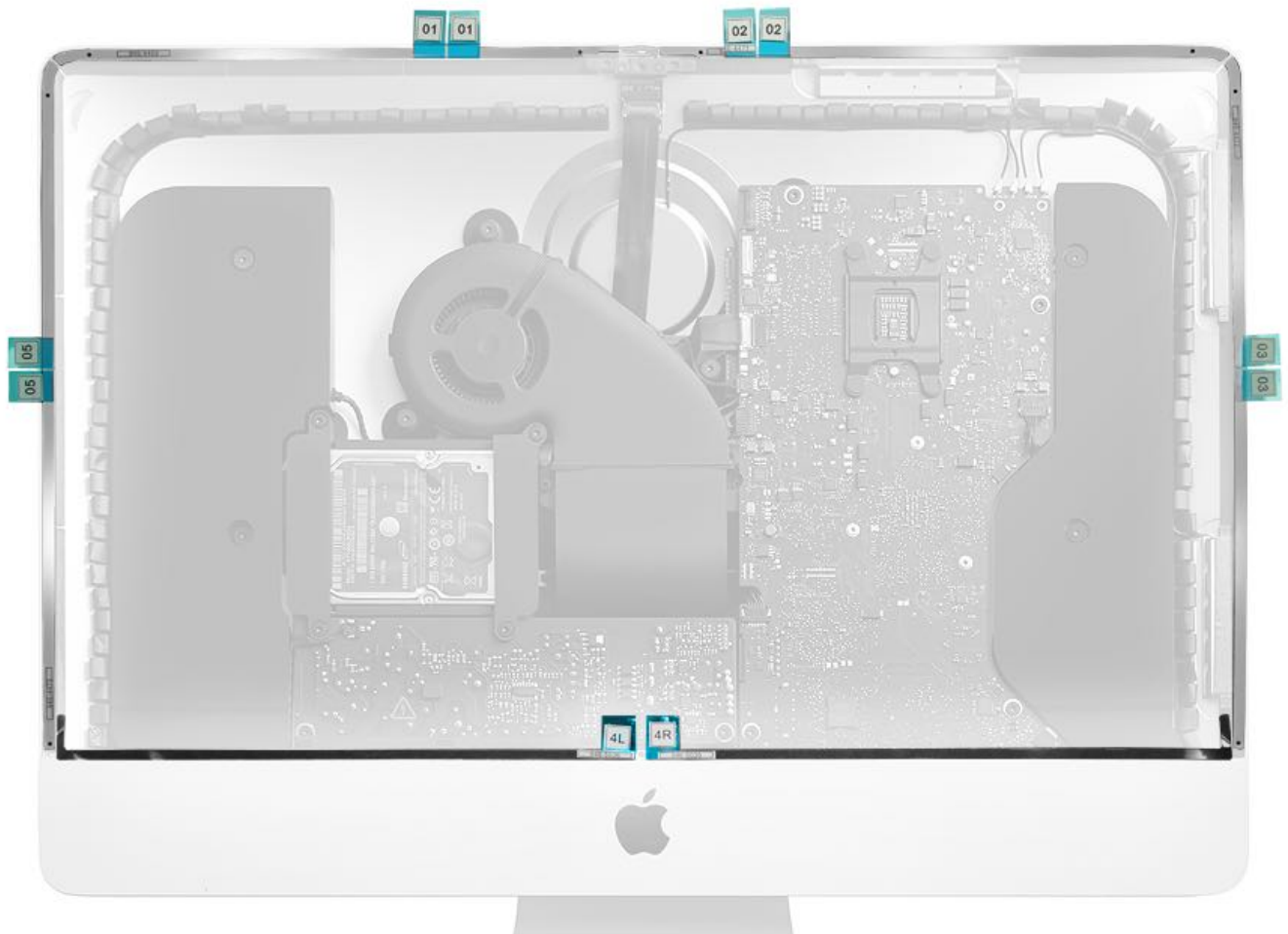
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

For video instruction, refer to Apple Support article [SV115: VHB Installation Video](#).

Before you begin:

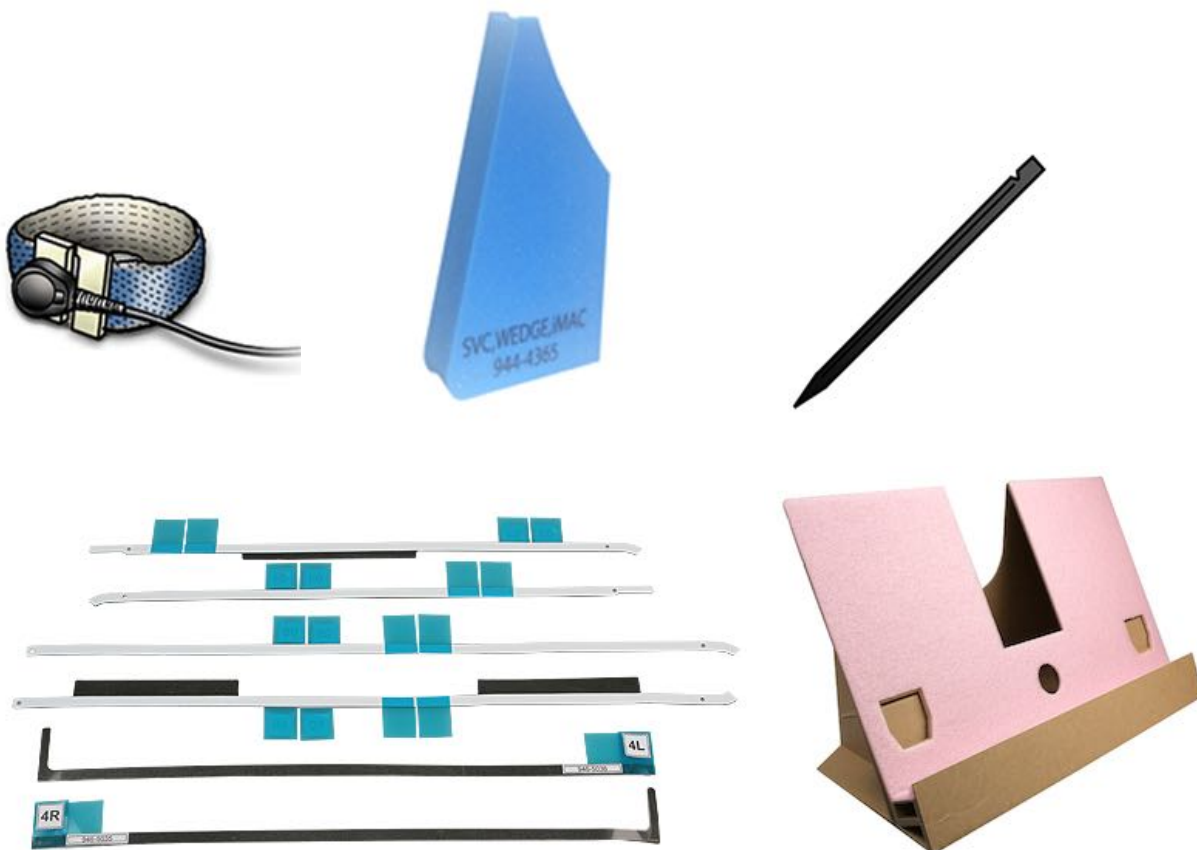
- [Display Panel Removal](#)
- [Display Panel - Removing Very High Bond \(VHB\) Strips](#)



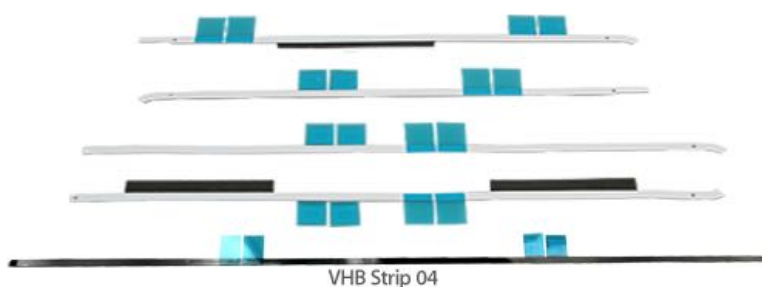
Tools

- ESD wrist strap and mat
- Service wedge, iMac
- Black stick
- Display Service Starter Kit, Very High Bond, VHB, 6-piece set, 20-pack, 076-1444
- Display Refill Kit, Very High Bond, VHB, 6-piece set, 20-pack, 076-1437
- Stand, LCD Service Support, 923-0416 (to support VESA mount adapter systems)

Note: Display Refill Kit 076-1422 is being replaced by kit 076-1437. The new kit includes Very High Bond (VHB)strips 4L and 4R to secure the bottom of the display. Strip 04 is being discontinued and replaced by strips 4L and 4R. Display Refill Kit 076-1437 may contain VHB strip 04 as well as strips 4L and 4R. If so, discard strip 04 and use strips 4L and 4R to secure the bottom of the display panel to the enclosure. Future refill kit orders should be made under part number 076-1437.



VHB strip ID 04 (946-4468) should be discarded. Use strips 4L and 4R shown above.





Steps For Removal

This is a reassembly instruction article. For removal steps, see [RP1022: Display Panel - Removing Very High Bond \(VHB\) Strips](#).

Steps For Reassembly

1. Insert the iMac service wedge. The AC receptacle is covered when the service wedge is installed correctly.

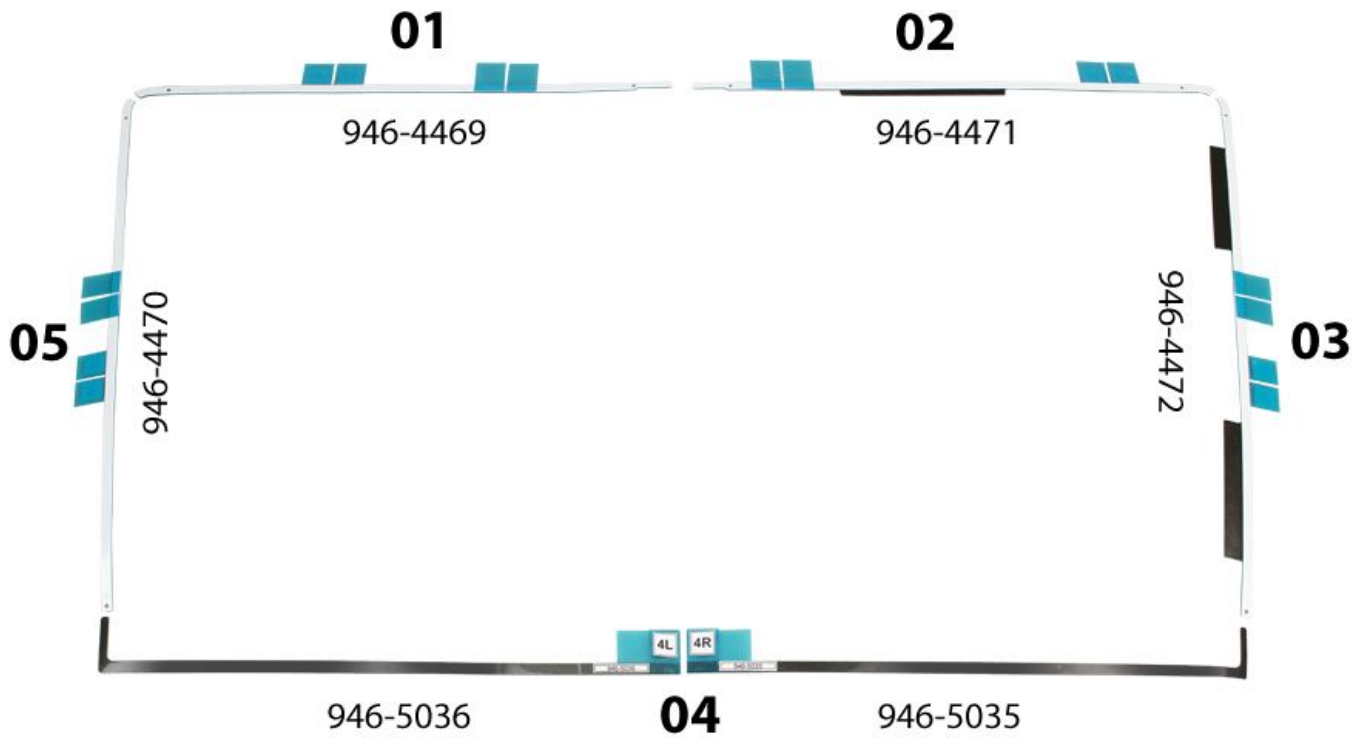


2. Each VHB strip has an ID number (on the pull tab) and part number (946-xxxx) printed on the strip. Use the picture below as a template to verify you have all the needed VHB strips. Lay out the VHB strips before installing them onto the computer and check them for damage. Make sure there are no wrinkles or exposed sections on the strip. Damage can cause cosmetic gap issues and could make the display bond weak or create light leakage.

Note: The original Display Refill Kit 076-1422 may contain VHB strip 04 as well as strips 4L and 4R. If so, discard strip 04 and use strips 4L and 4R to secure the bottom of the display panel to the enclosure. Future refill kit orders should be made under 076-1437.

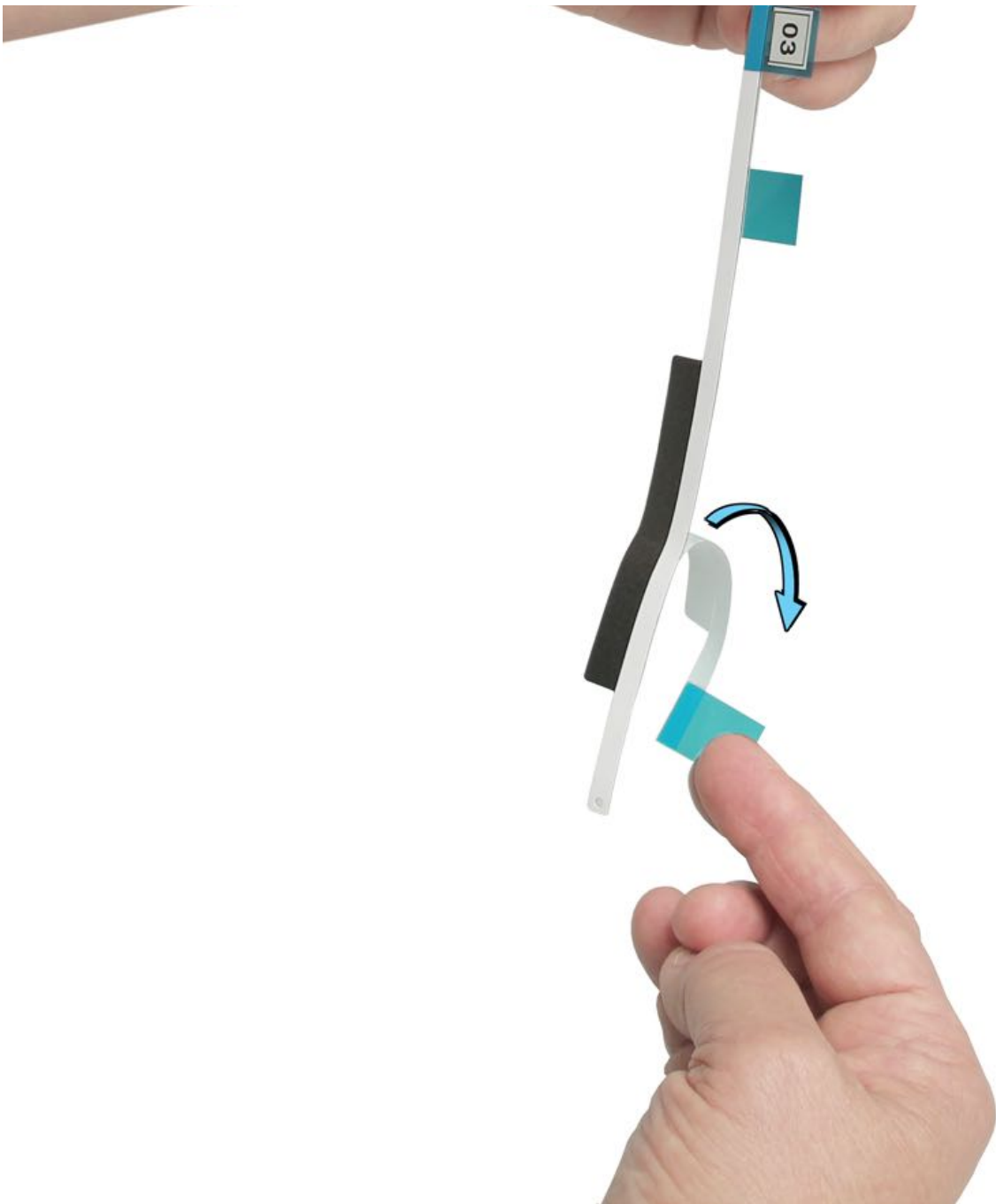
VHB Strip Description	VHB Strip ID Number	Part Number on VHB Strip
Top left	01	946-4469
Top right	02	946-4471
Right side	03	946-4472
Left side	05	946-4470
Bottom, left	4L	946-5036
Bottom, right	4R	946-5035

VHB layout for iMac (21.5-inch, Late 2012, Early 2013, Late 2013) models



3. The VHB strips have a foam layer (VHB/foam/VHB), with a removable paper liner on the underside, and a clear plastic liner on the top side. The image below shows peeling the paper liner off the underside of the VHB strip.





4. Before adhering the VHB strips and installing the display, verify that all cables are connected, all screws are installed, and no debris present in the computer.



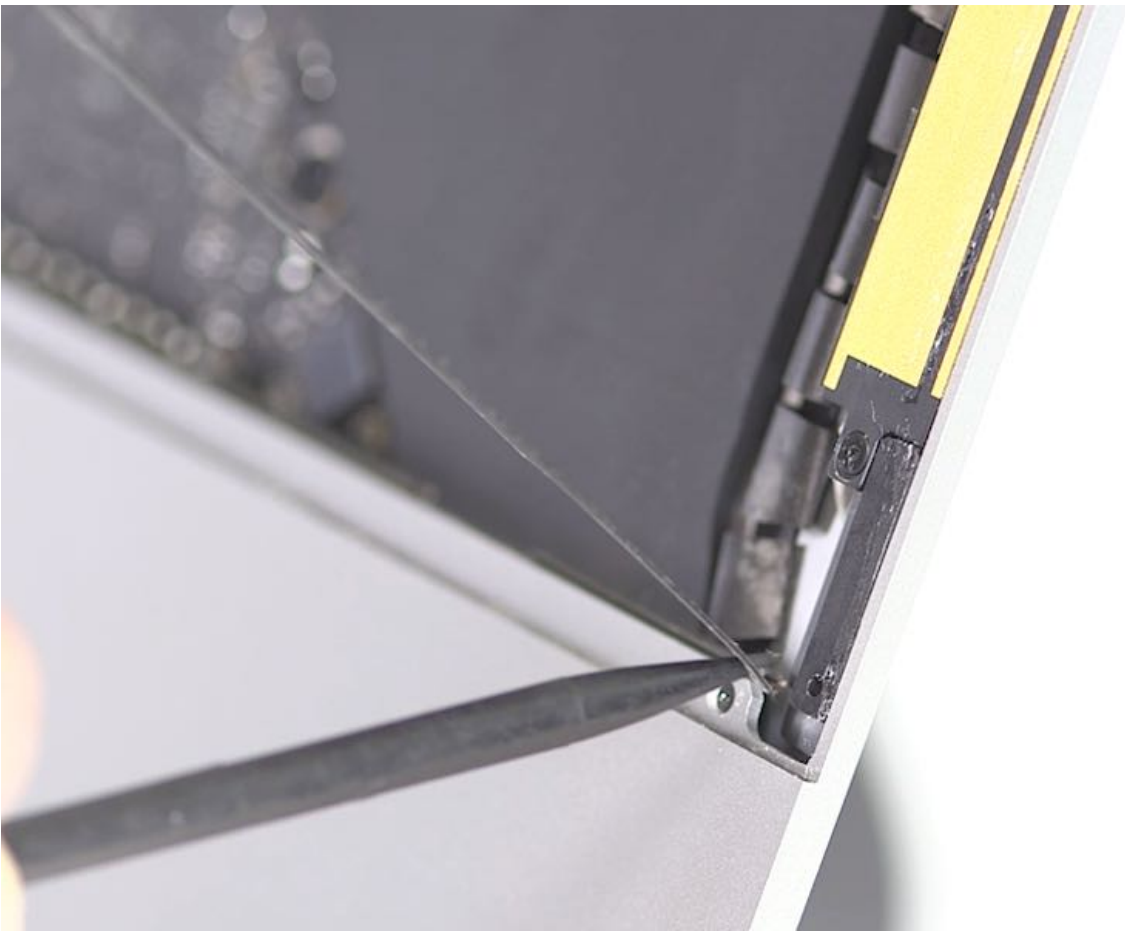
5. The rear housing has eight (8) VHB alignment holes. Use them to align the new VHB strips.



6. Peel the paper backing off of one portion of a VHB strip.



7. Push the pointed end of a black stick through the alignment hole in the VHB strip. Then point the black stick into the corresponding alignment hole in the rear housing. Keep the VHB strip pulled taut throughout the installation process.



8. Push gently upward with your finger to adhere the bottom of the VHB strip in place.



9. Insert the pointed end of the black stick in the other alignment hole and peel the paper backing off.



10. With the black stick in the alignment hole, position the VHB strip on edge of rear housing. Use your finger to gently smooth the strips. Make sure there are no wrinkles, overlaps or bumps on the strip. Improper installation may result in cosmetic issues.



Note: There are no guide holes on the VHB strip or rear housing for the bottom strips. Align the strip carefully by hand.

11. Two strips of VHB are used along the bottom edge (labeled 4L and 4R). Start in the center of the chin and align the VHB strips to the left and right of the center screw hole (as shown). The angled ends of the VHB strip should attach to the rear

housing, and should not overlap the VHB strips on the sides.



Note: If any VHB strip does not line up correctly, remove it, clean the rear housing, and start again. Make sure there are no wrinkles or exposed sections on the strip. Damage can cause cosmetic gap issues, may make the display bond weaker or create light leakage.

12. To install the display panel, go to [RP1024: Display Panel Replacement](#).

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Display Panel Replacement

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

For video instruction, refer to Apple Support article [SV117: Display Panel Replacement Video](#).

Before you begin:

- [Display Panel Removal](#)
- [Display Panel - Removing Very High Bond \(VHB\) Strips](#)
- [Display Panel - Replacing Very High Bond \(VHB\) Strips](#)



Tools

- Display removal tool
- iMac service wedge
- Isopropyl Alcohol (IPA) wipes (to remove residual VHB adhesive)
- Safety glasses
- Painter's tape (tape that does not leave a residue, 1- 2-inches wide, preferably 2-inch, if available)
- Silicone display roller
- Clean, damp, lint-free cloth (to clean display panel glass)



Steps For Removal

This is a reassembly instruction article. For removal steps, see the following articles:

- [RP1021: Display Panel Removal](#)
- [RP1022: Display Panel - Removing Very High Bond \(VHB\) Strips](#)
- [RP1023: Display Panel - Replacing Very High Bond \(VHB\) Strips](#)

If you have already performed the tasks listed above, then proceed to the next step.

Steps For Reassembly

1. Install the service wedge between the stand and the back of the rear housing. The AC receptacle is covered when the service wedge is installed correctly.



2. Before installing make sure all VHB adhesive residue is cleaned off of the display panel and the rear housing.

Note: If the display panel cracks or breaks see Apple Support article [TP819: Cleaning and Handling the Display Panel](#).



3. Place the display panel bottom edge on chin of rear housing.



4. Align the display panel and make sure it is centered and seated. Use the display removal tool to check alignment on both sides of the display. Adjust if necessary. As you look straight on (as a user would) at the display, you do not want to see any silver from the rear housing showing at the sides of the display.



5. Stand back to check the alignment of the display. If the rear housing can be seen, adjust and check again.

INCORRECT



CORRECT



6. Anchor the display panel with a strip of painter's tape. Place the tape over the bottom of the display and the edge of the rear housing.



7. Step back and check for alignment again. The picture below shows incorrect alignment with the silver rear housing showing on the right side of the display. If the rear housing can be seen, adjust the alignment and check again.



8. Place two vertical pieces of painter's tape along the bottom piece for added support.



9. Use one hand to tilt the display toward you.



10. Use the other hand to pull the top release liners on the VHB strips at the chin. Pull slowly so they do not tear or break. To prevent contaminating the VHB strips while connecting the display cables, only remove the chin release liners for now.



11. Tilt the display, leaving enough room to connect the power and Embedded Display Port (eDP) cables to the logic board. If these cables are not connected properly it could result in no video or no power.



12. Connect two (2) cables:

- **display power cable:** Push the cable straight into its connector.
- **eDP cable:** Push the cable straight into its connector and move the locking lever forward.

Check that the connectors are firmly seated.

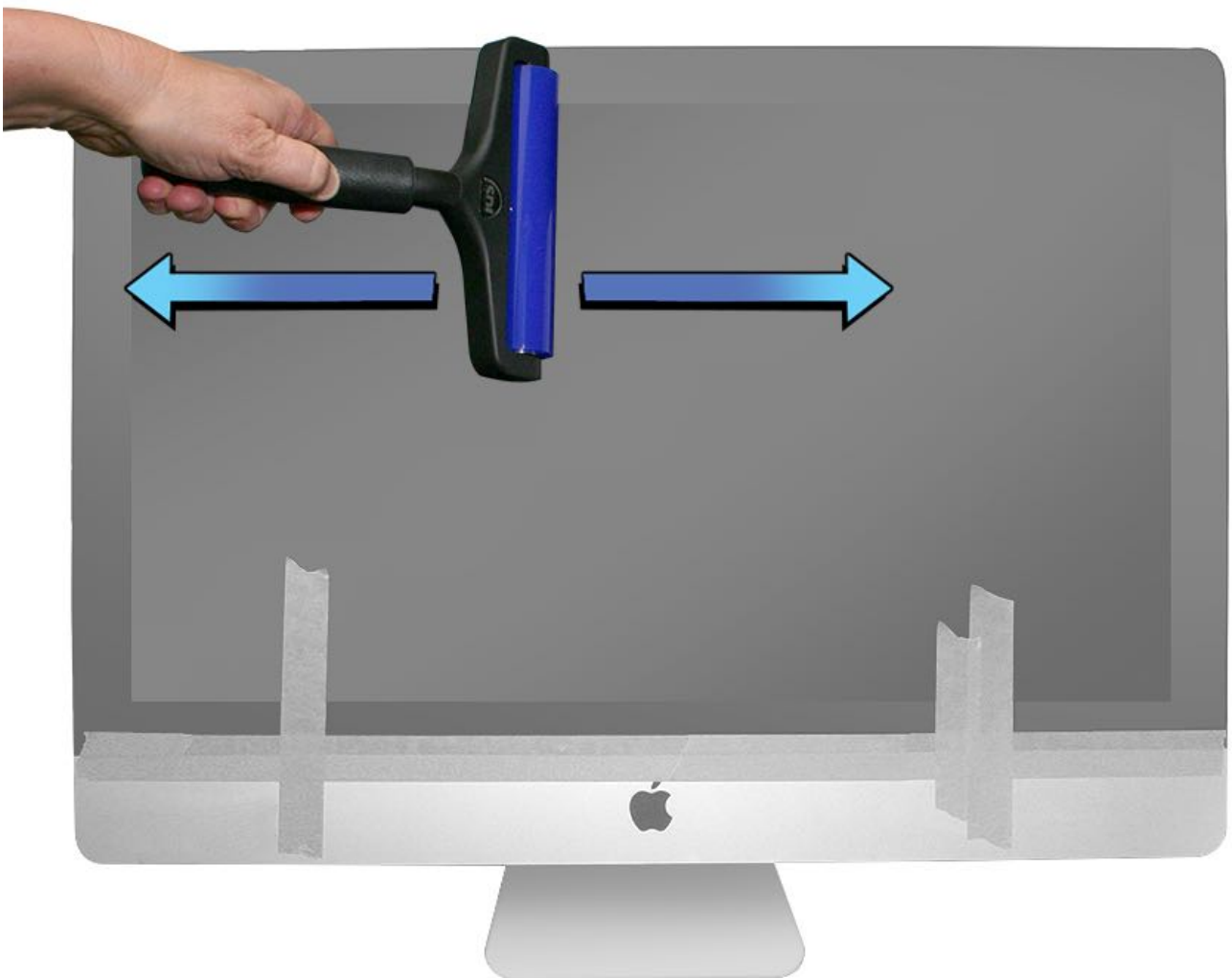


13. Remove any remaining VHB release liners and press the display panel back firmly.

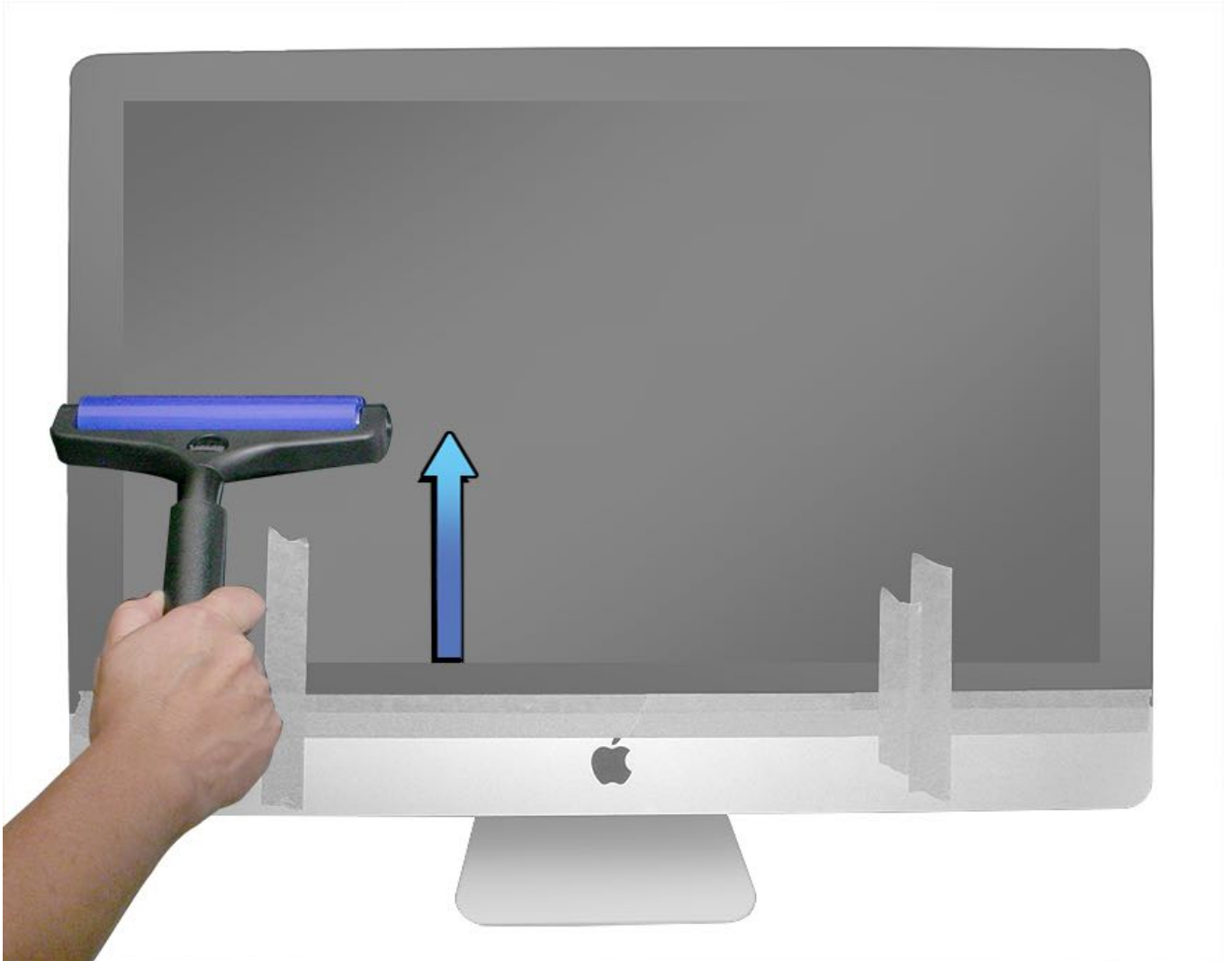


14. Use the silicone roller to adhere the VHB. Use the other hand to keep the computer steady.

Caution: Do not pinch or press the perimeter of the glass with your fingers. This may cause the glass to chip or crack.



15. Along the right and left sides, start at the bottom edge and roll in an upward direction only. Do not roll up and down.



16. Remove the tape.



17. Clean the front of display with a clean, damp, lint-free cloth. **Note:** IPA wipes should only be used to remove residual

VHB adhesive.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Embedded DisplayPort (eDP) Cable

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

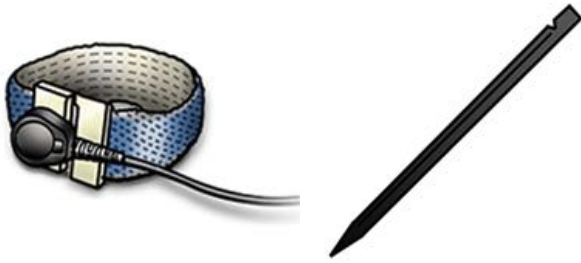
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



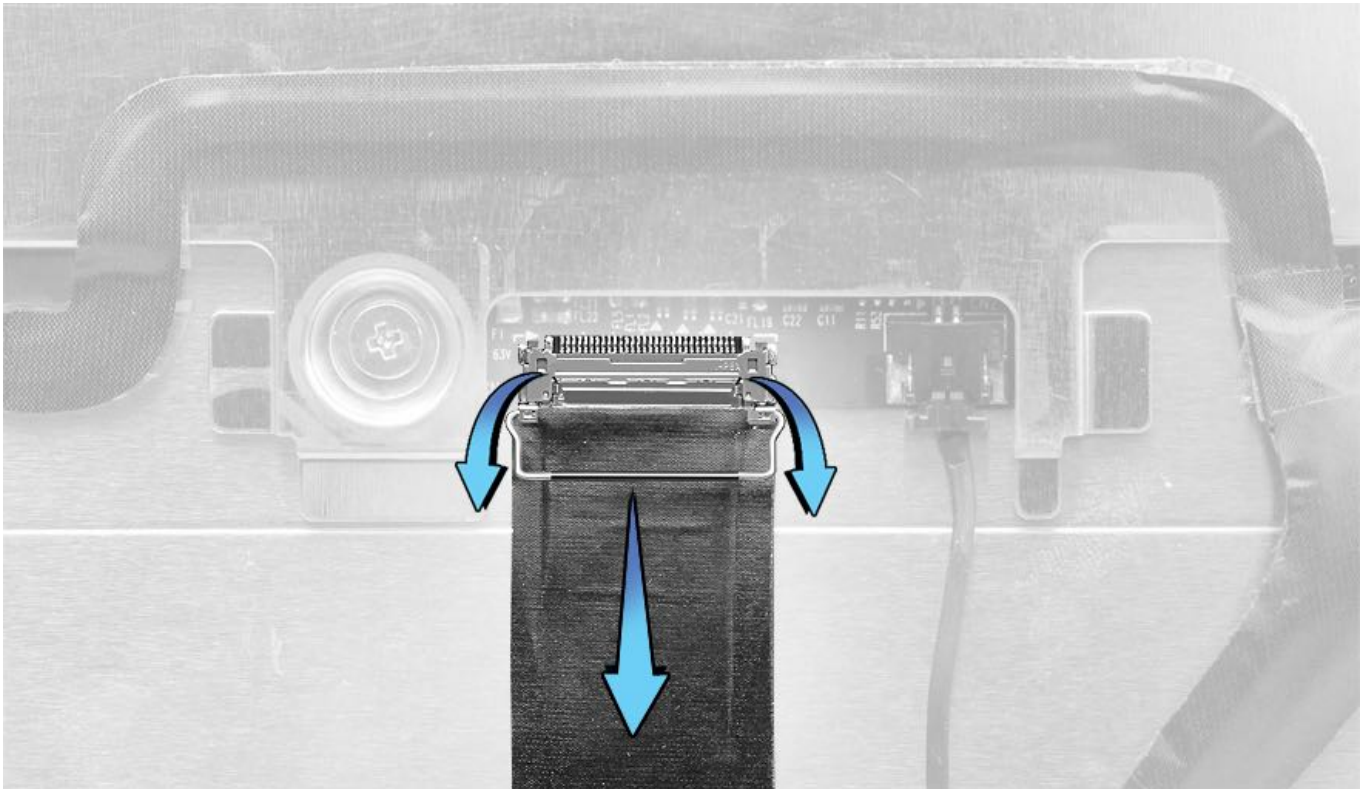
Tools

- ESD wrist strap and mat
- Black stick



Steps For Removal

1. Remove any tape securing embedded DisplayPort (eDP) cable to display panel.
2. Use a black stick to “unlock” the lock bar by gently flipping the bar towards the display port cable.
3. Gently pull eDP cable out of the connector.



Steps For Reassembly

1. Insert eDP cable into its connector. Flip the lock bar up, making sure cable is securely connected. Replace any tape covering the cable.
Important: Press down around lock bar to lock the lever into place.
2. [Replace Display Panel VHB Strips.](#)
3. [Replace Display Panel.](#)

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Display Thermal Sensor Cable

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

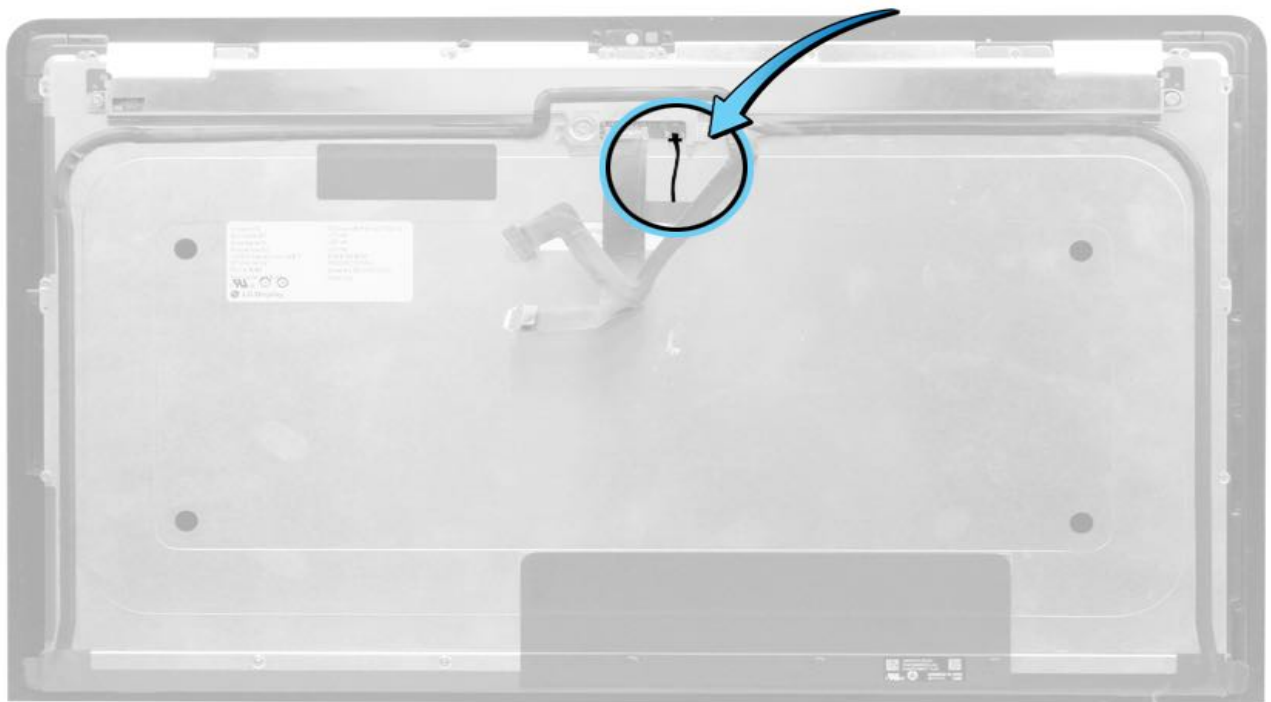
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

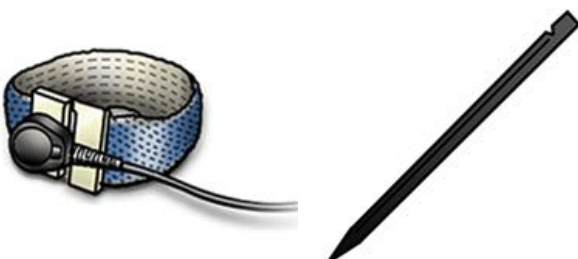
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



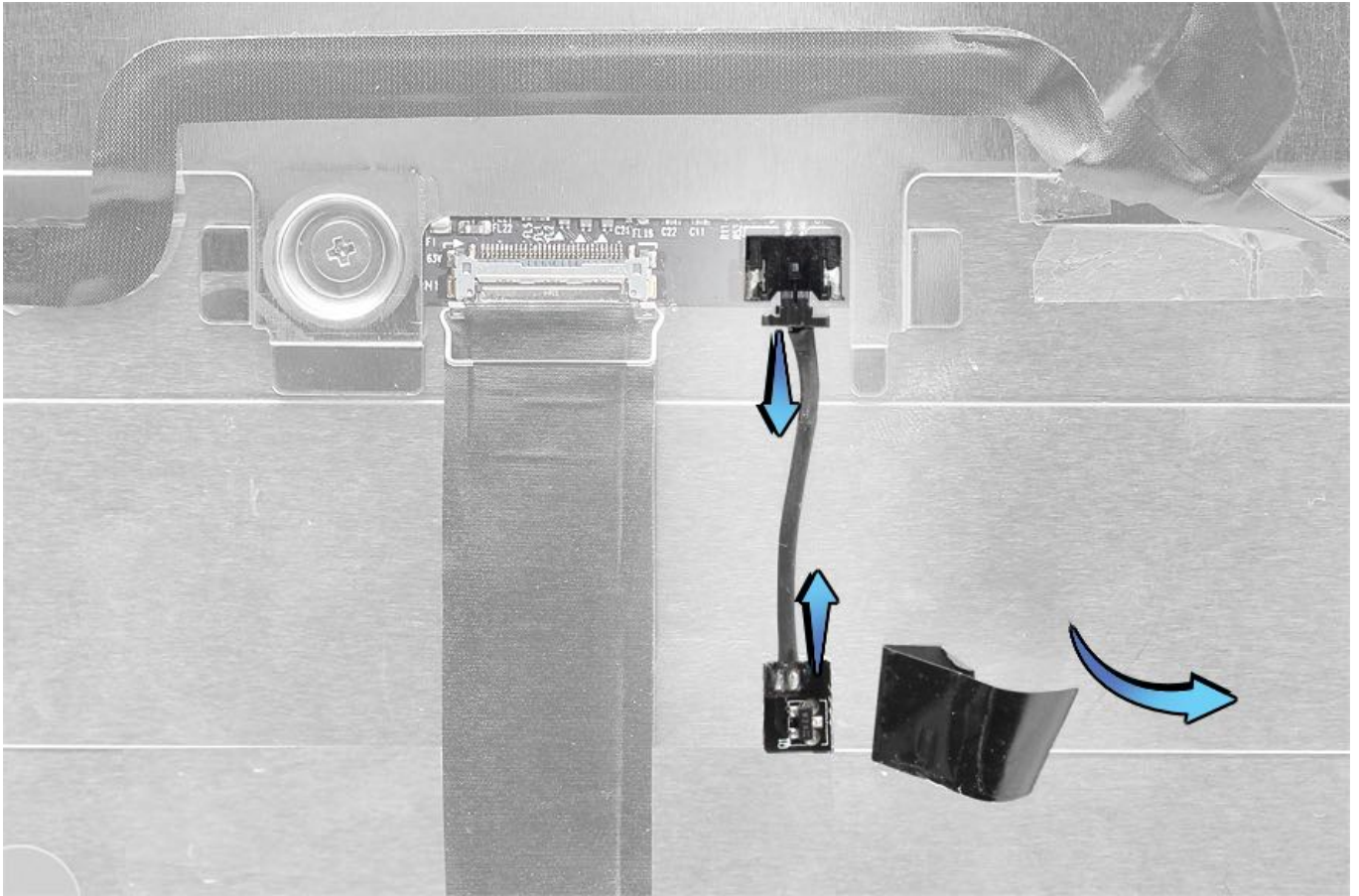
Tools

- ESD wrist strap and mat
- Black stick



Steps For Removal

1. Remove any tape securing the display thermal sensor cable to the display panel.
2. Use pointed end of a black stick to gently push display thermal sensor cable out of its connector.
3. Use a black stick to gently pry the square sensor board off the display panel.



Steps For Reassembly

1. Peel and stick new square sensor board to back of display panel.
2. Insert cable into its connector.
3. Secure the cable with tape.
4. [Replace Display Panel VHB Strips.](#)
5. [Replace Display Panel.](#)

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Camera

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

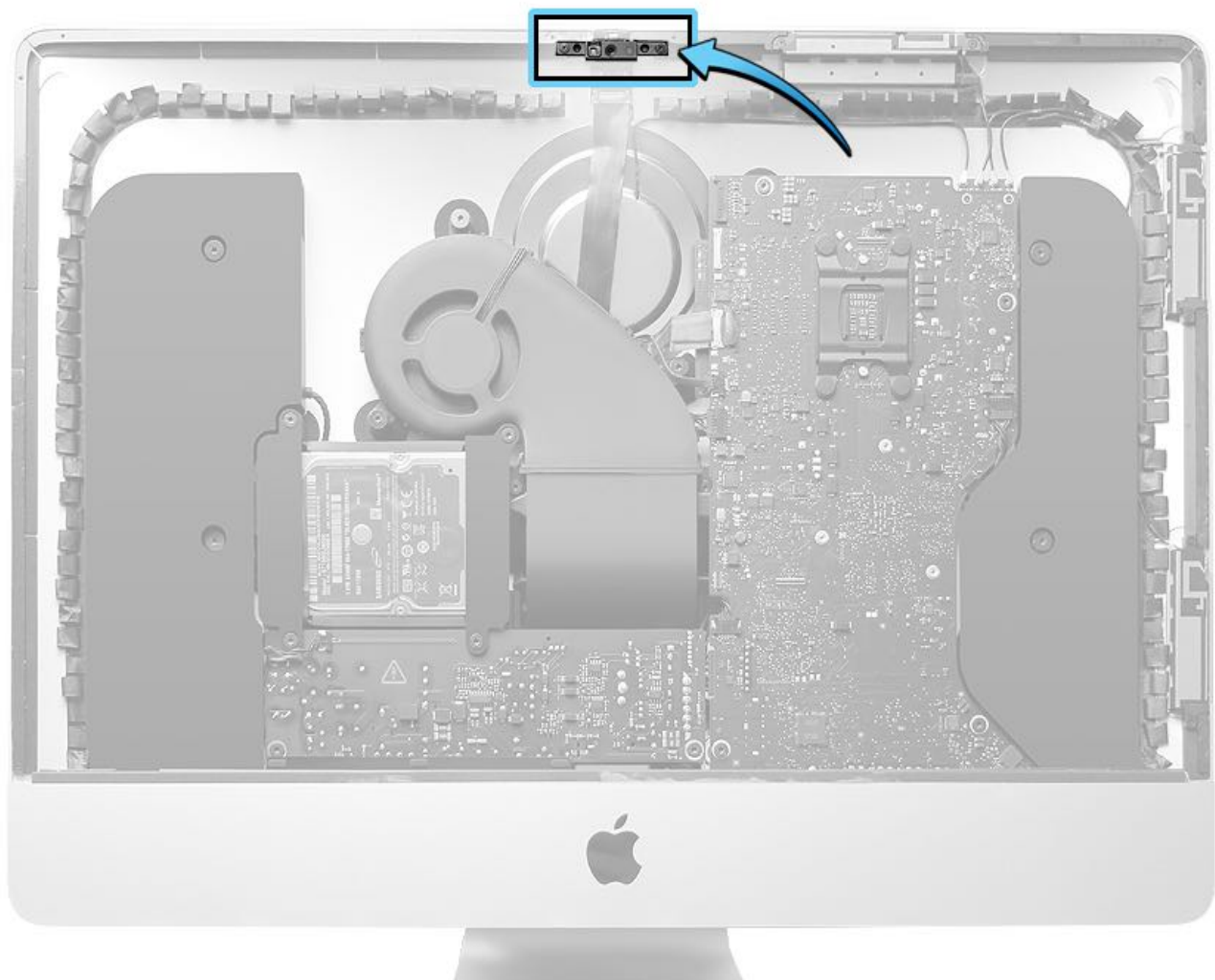
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

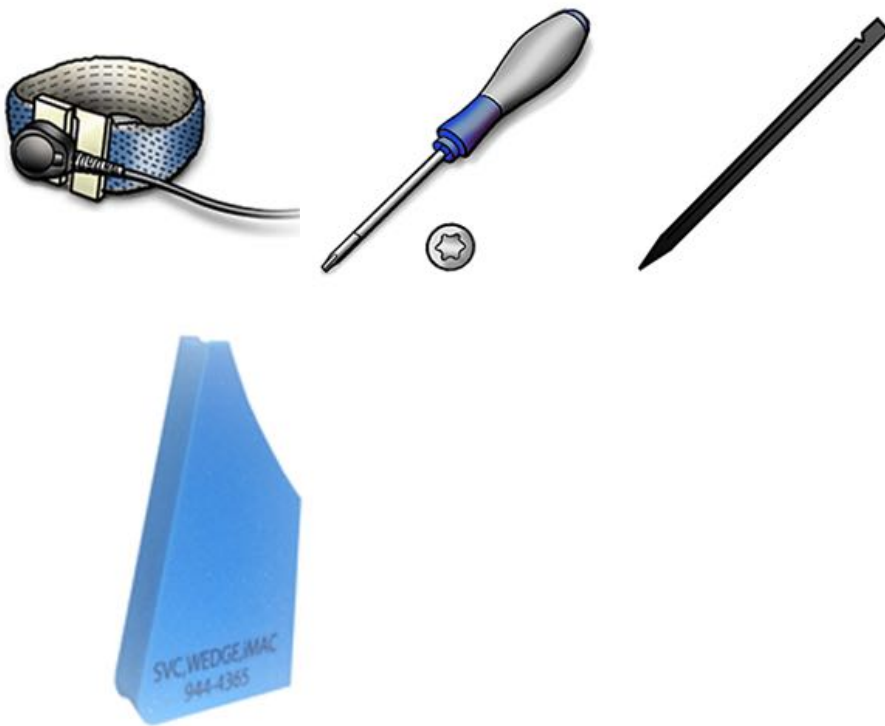
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



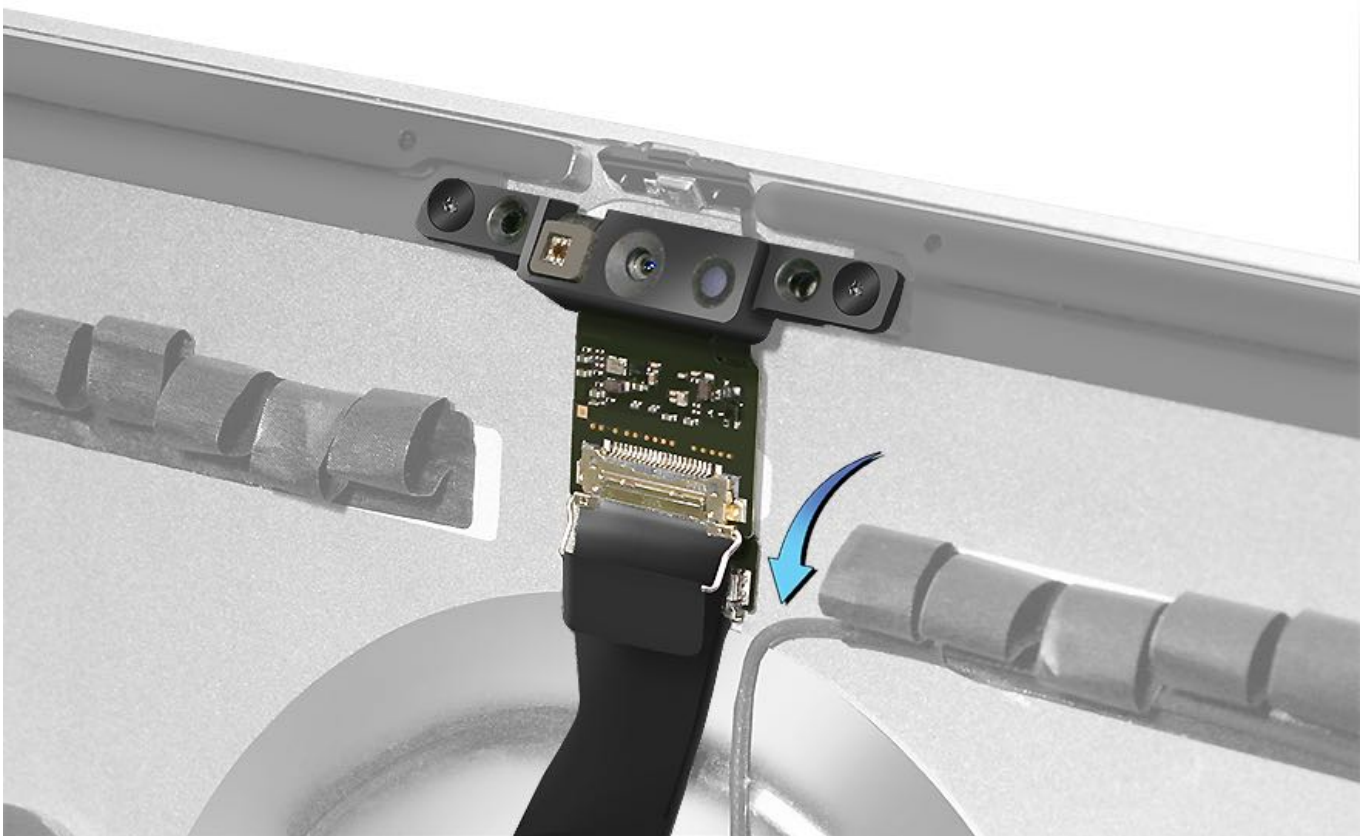
Tools

- ESD wrist strap and mat
- Magnetized Torx 4 screwdriver
- Black stick
- Service wedge, iMac

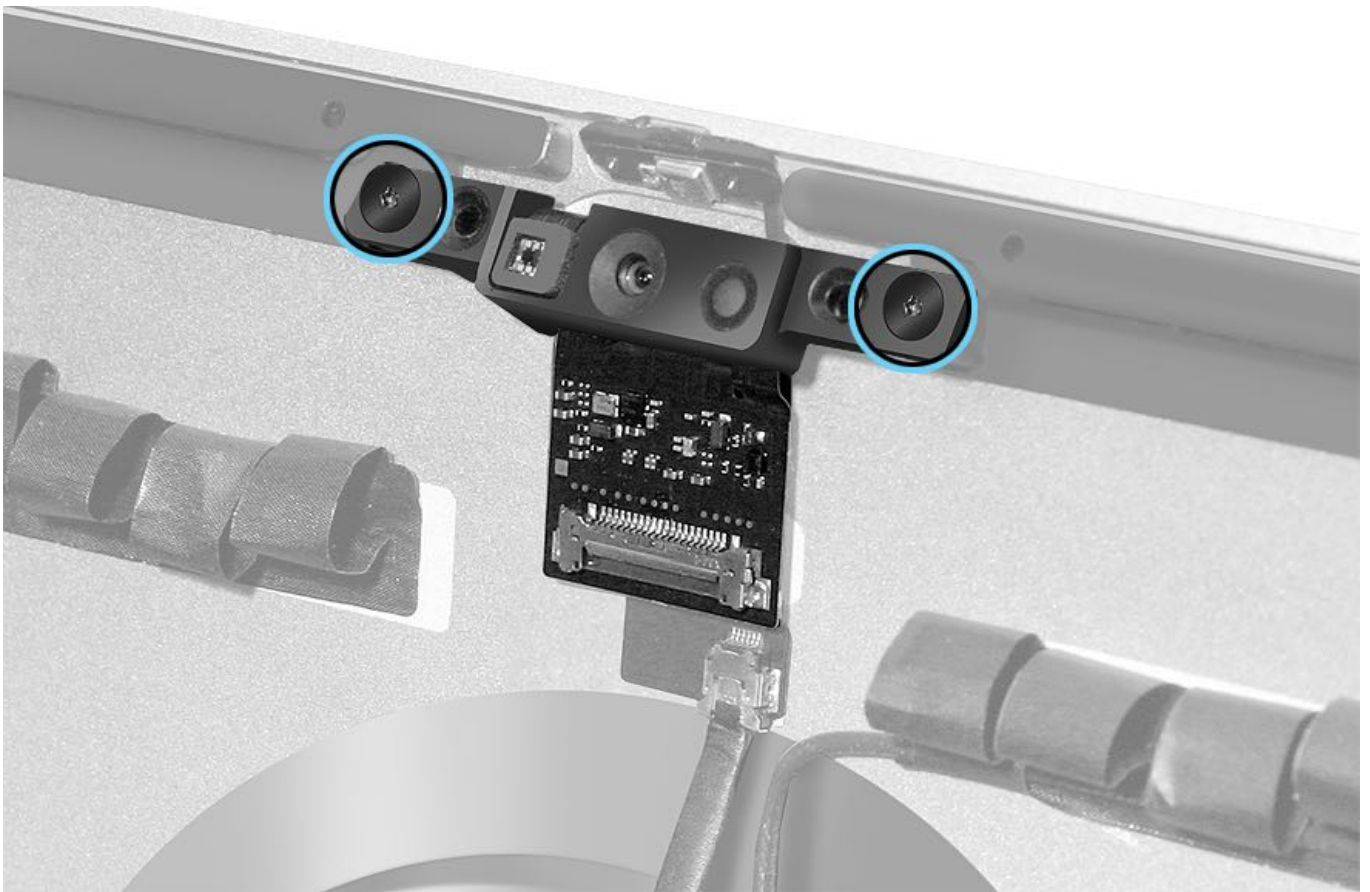


Steps For Removal

1. Use a black stick to “unlock” lock bar by gently flipping the bar over towards cable. Gently pull cable — not lock bar — out of connector.

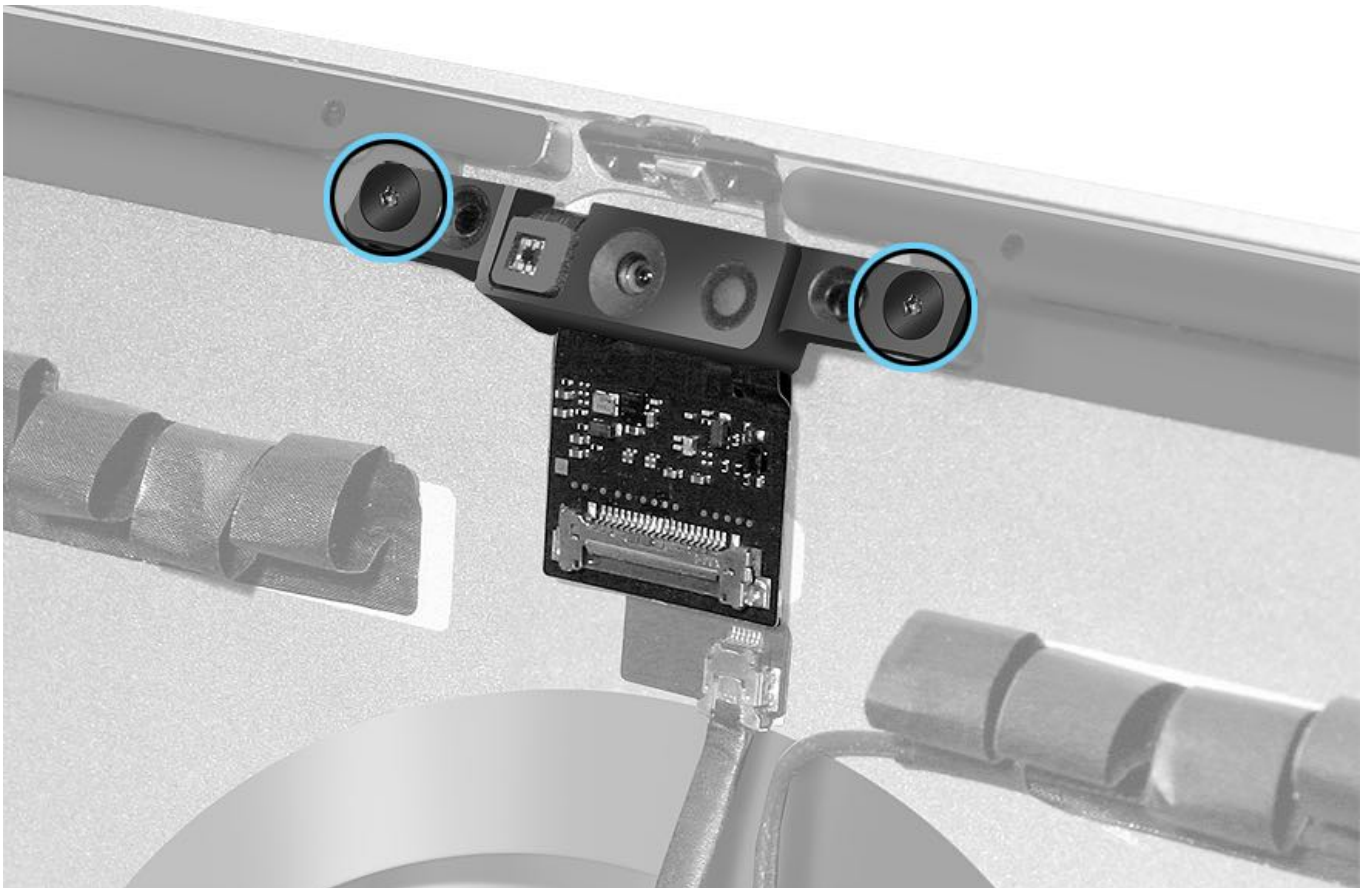


2. Remove two (2) 3.9mm T4 screws (923-0339) from camera.



Steps For Reassembly

1. Install two (2) 3.9mm T4 screws (923-0339) to camera. **Note:** If installing a replacement camera, don't forget to remove the protective film covering the lens.



2. Carefully insert camera cable into connector. Make sure cable is firmly inserted into connector.

3. Flip lock bar up.

Important: Press around edges of lock bar to secure camera cable.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Camera/Microphone Cable

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



Tools

- ESD wrist strap and mat
- Black stick
- Service wedge, iMac

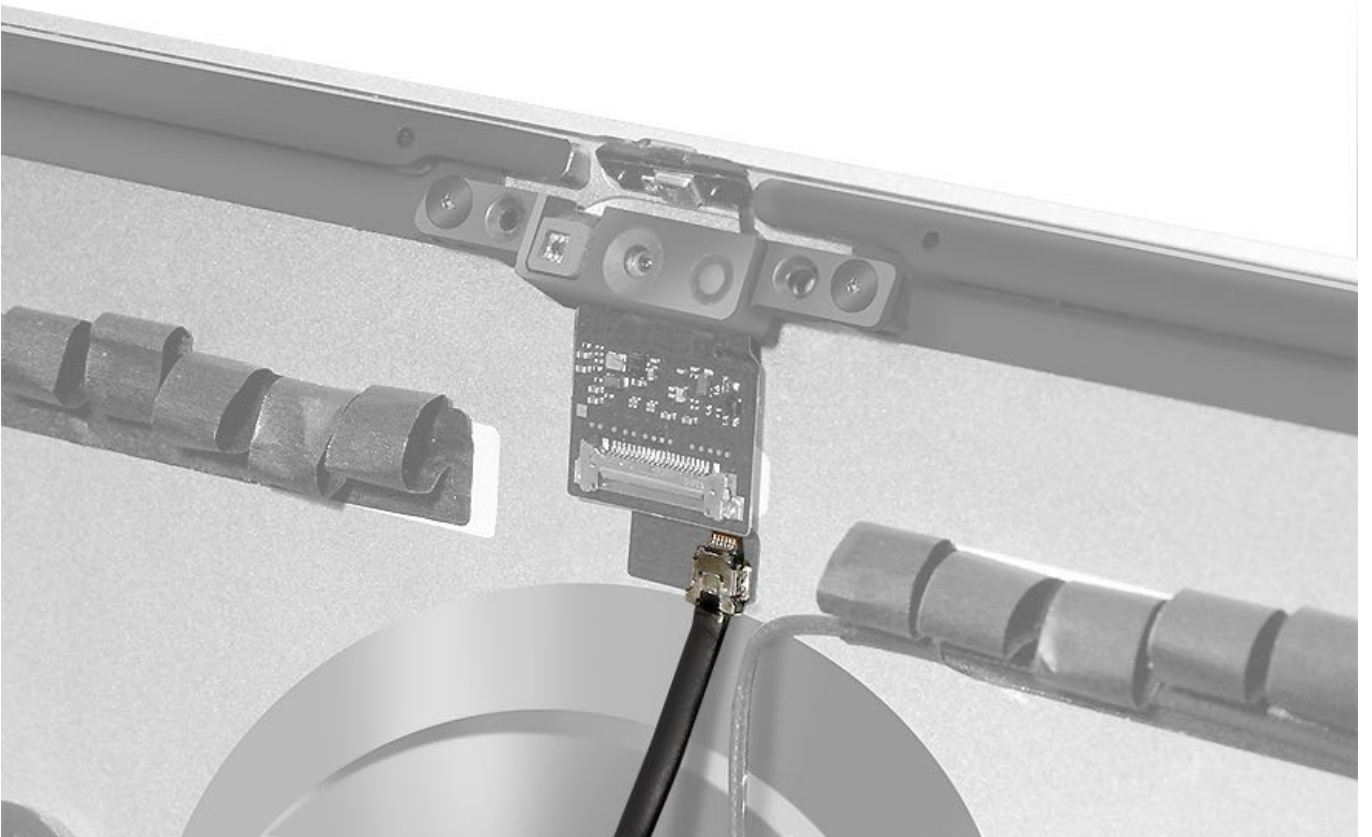


Steps For Removal

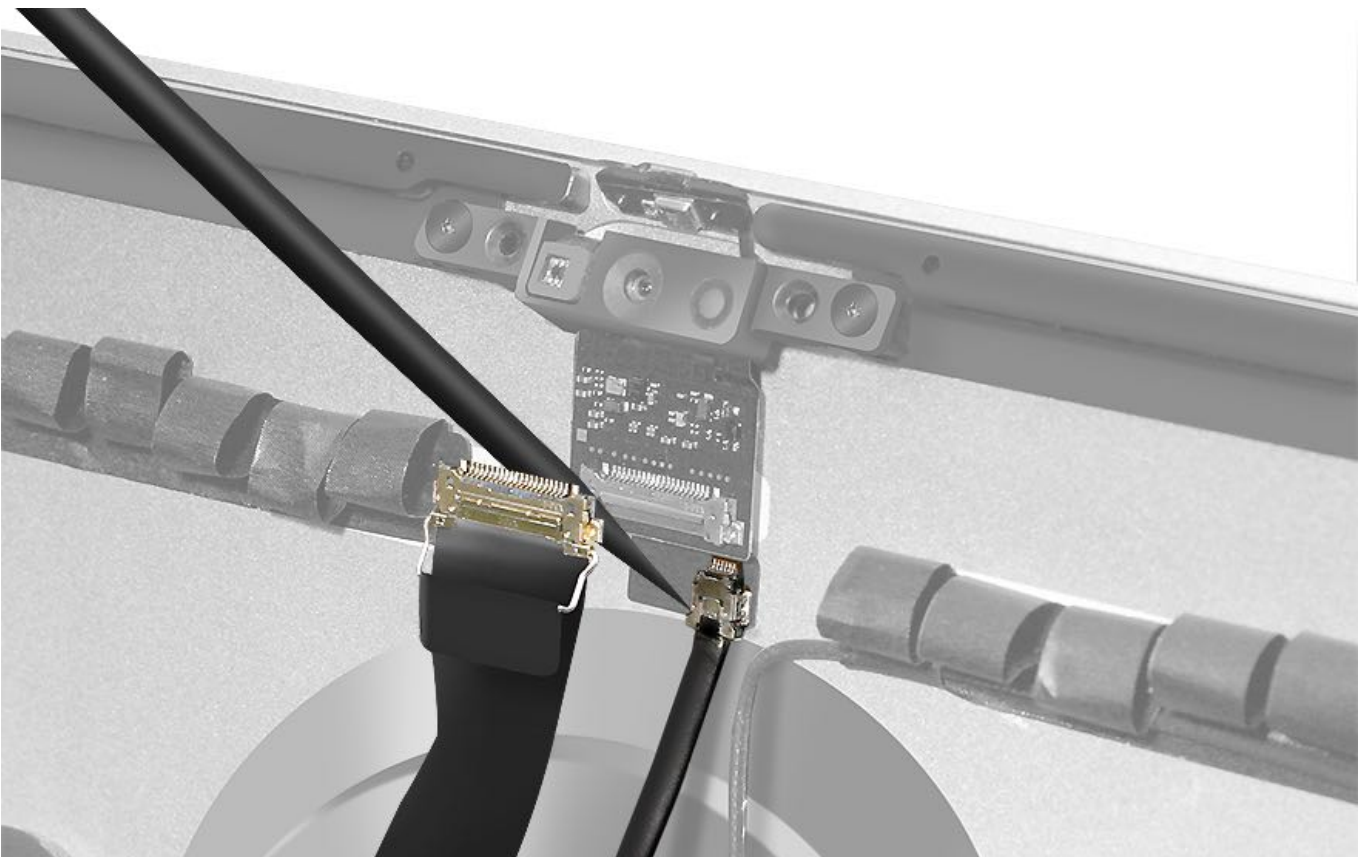
1. Use a black stick to "unlock" locking-lever bar on camera cable.
2. Pull camera cable straight out from connector on camera board.



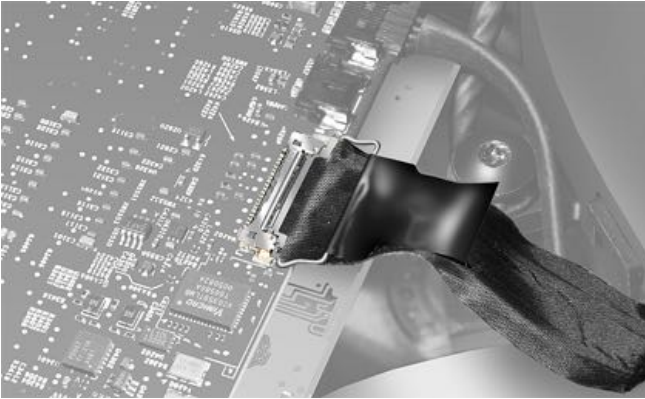
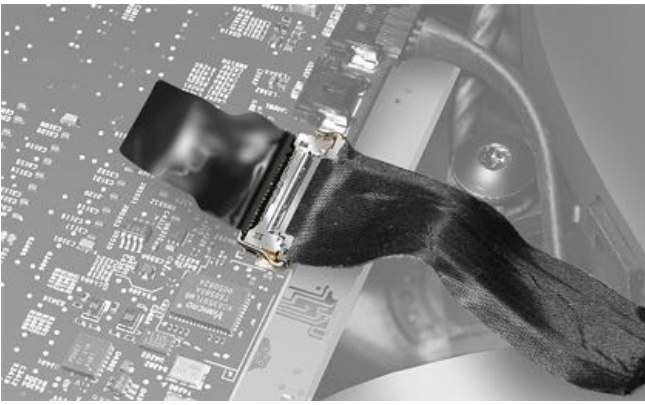
Note: The microphone cable is behind and attached to the camera cable. Pull camera cable down enough to reveal the microphone cable. (Camera cable is moved for visibility in image below.)



3. Disconnect microphone cable with a black stick.

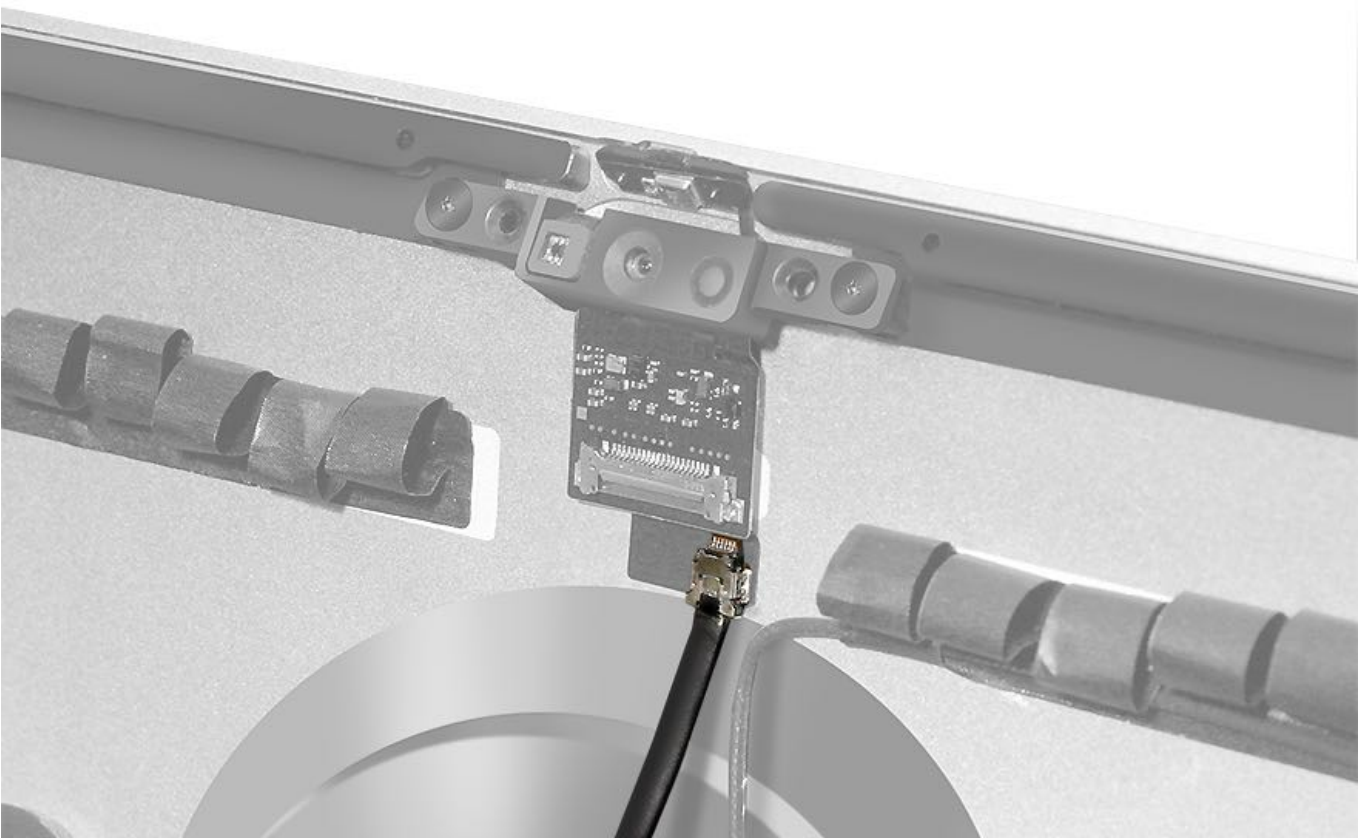


4. Disconnect camera/microphone cable from logic board. Flip the locking-lever bar back and pull the cable straight out out of the connector.



Steps For Reassembly

1. Connect microphone cable.

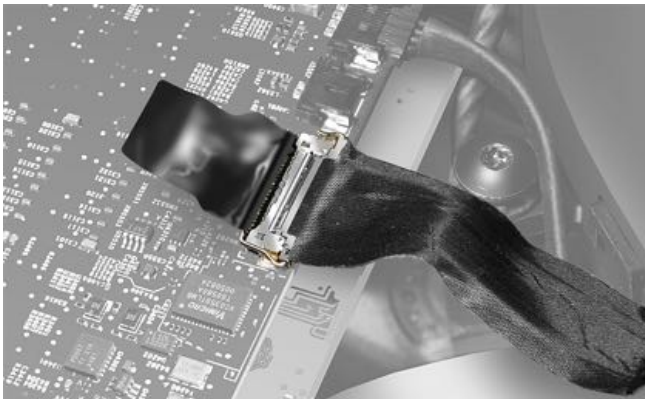


2. Connect camera cable to camera board. Flip locking-lever bar up and make sure it is secure.
3. Press along cable to adhere it to the rear housing.



4. Insert cable into logic board connector and flip the locking-lever bar down.

Important: Press down around locking-lever bar to securely lock the cable connector in place.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Bluetooth Antenna, Upper

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

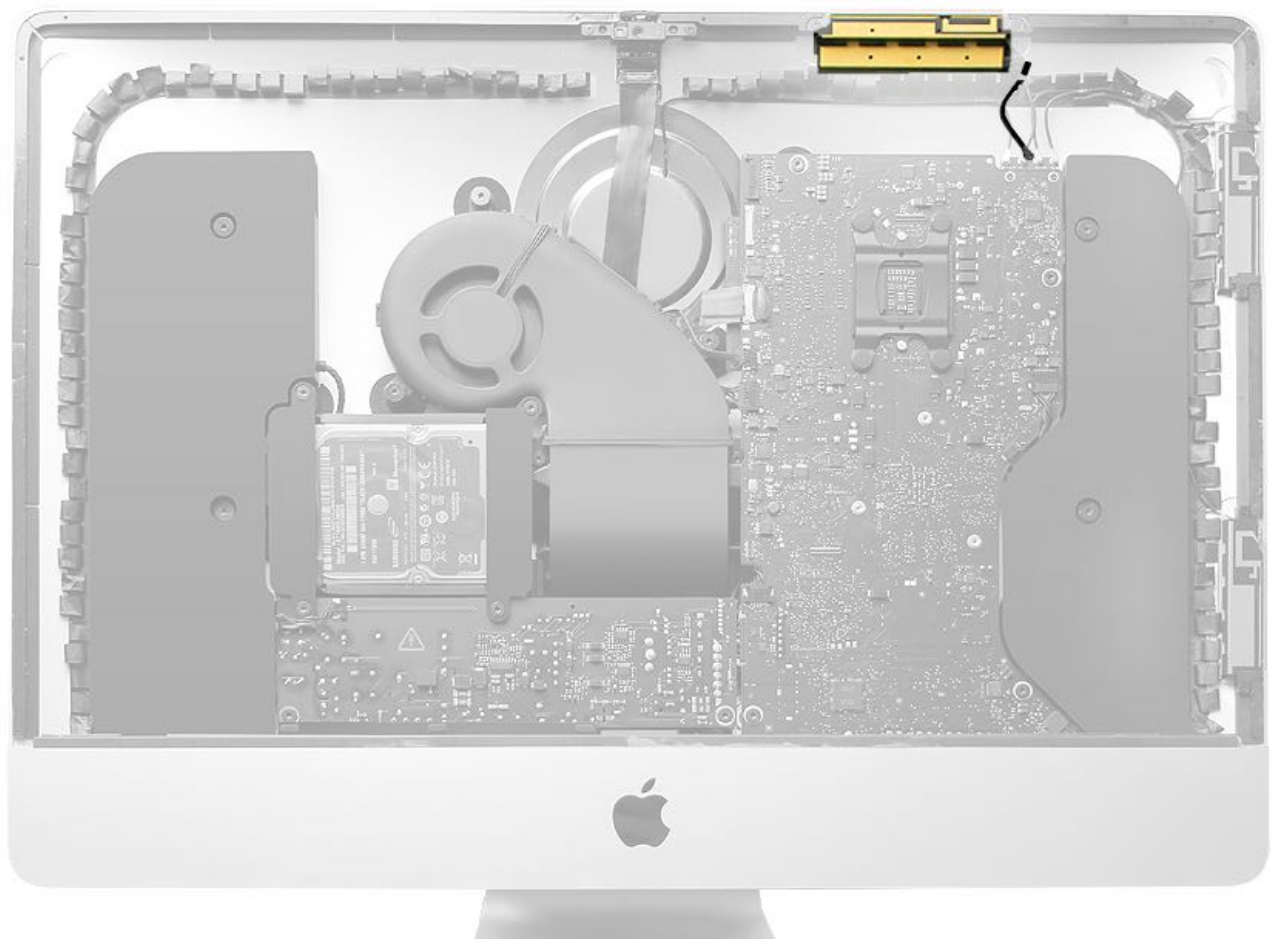
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

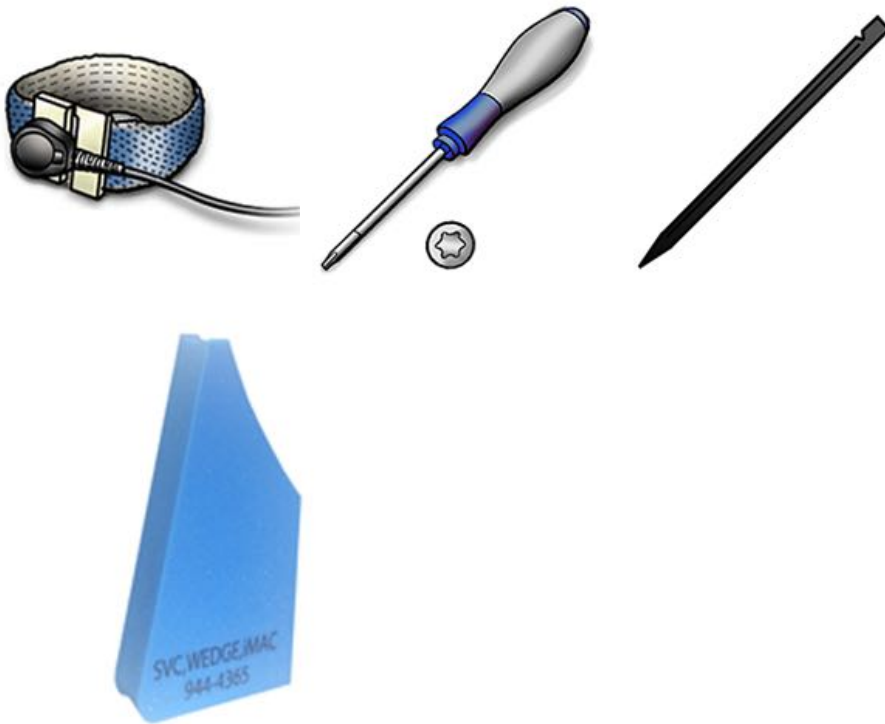
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



Tools

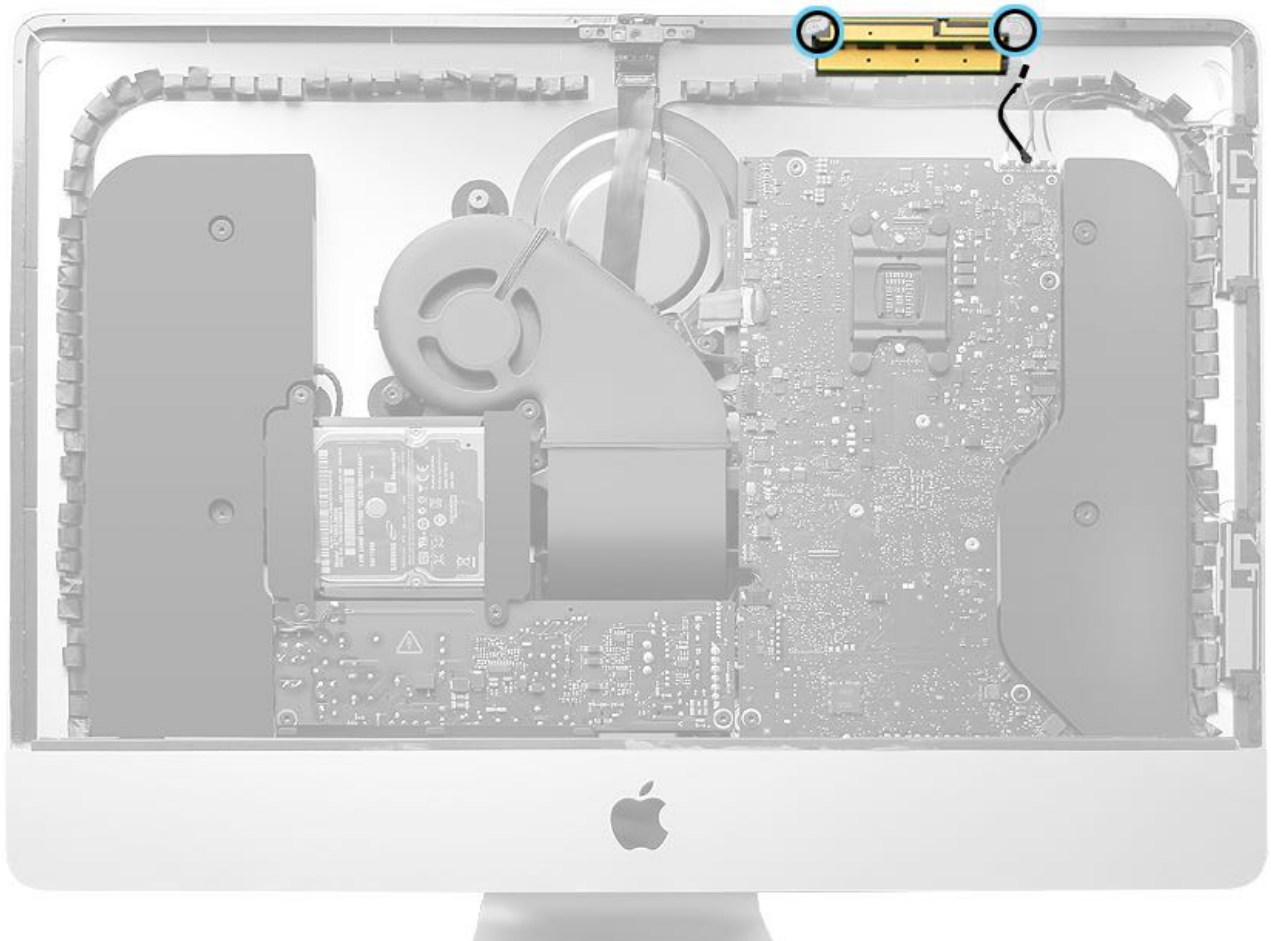
- ESD wrist strap and mat
- Magnetized Torx 4 screwdriver
- Black stick
- Service wedge, iMac



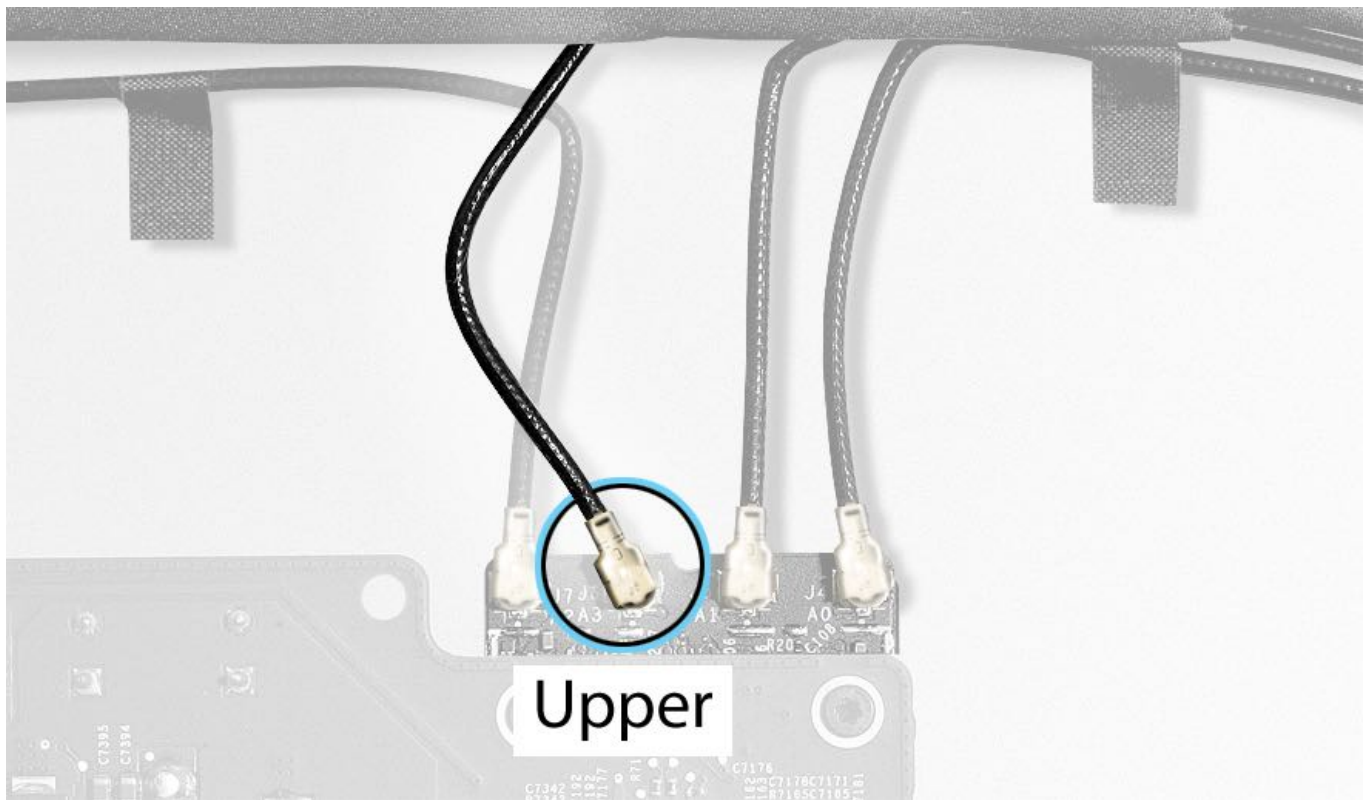
Steps For Removal

iMac (21.5-inch, Late 2012, Early 2013, Late 2013) has four (4) Wi-Fi/Bluetooth antennas, three (3) of which are removable. The fourth resides inside the Apple logo in the rear housing and can only be repaired by replacing the rear housing.

1. Remove two (2) T4 screws (922-0337) from Bluetooth antenna.
2. Using a black stick, peel up the tiny pieces of mylar tape located within the airloop gasket running alongside the antenna.

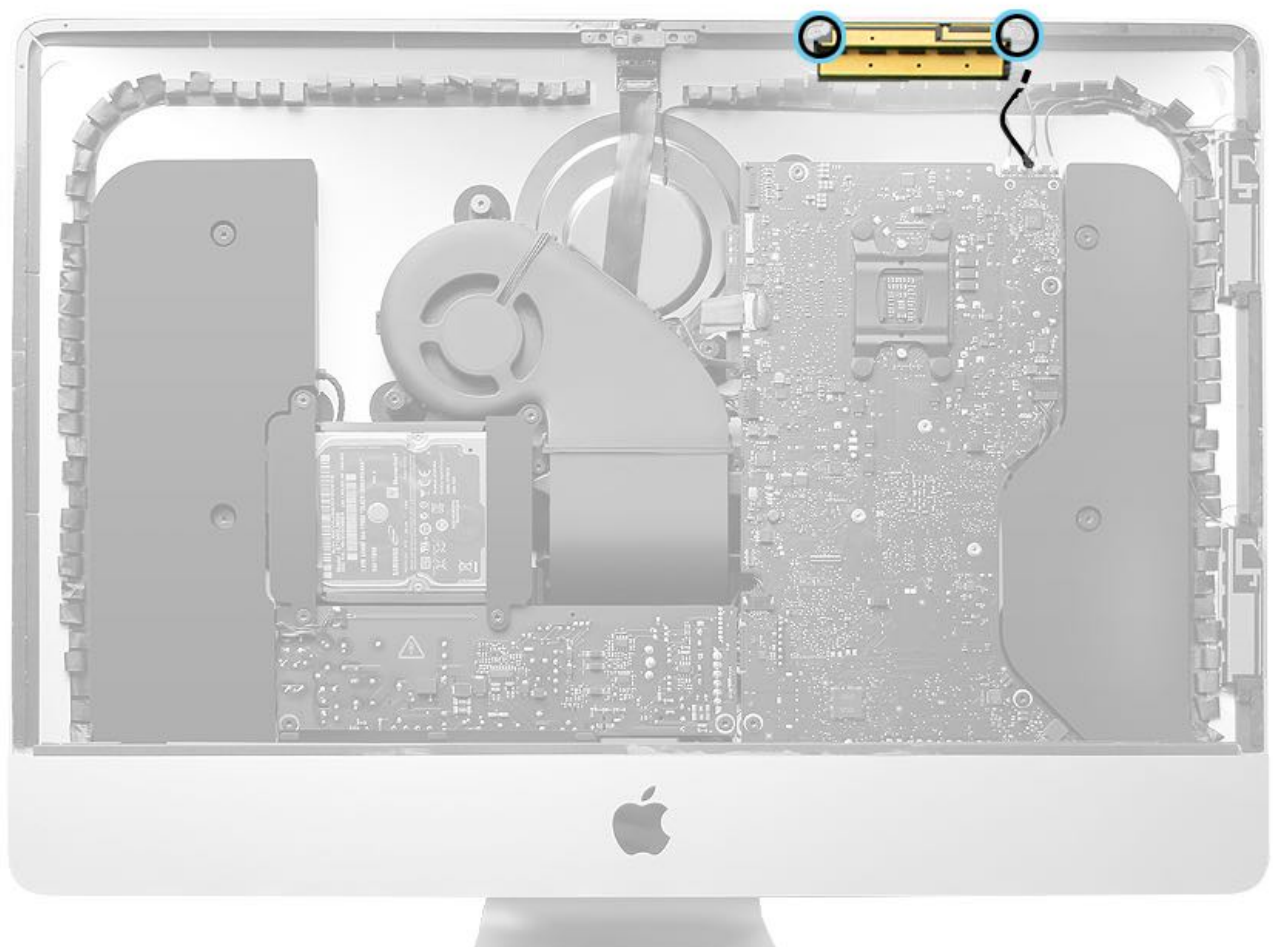


2. Disconnect Bluetooth antenna "Upper" cable from the wireless card.

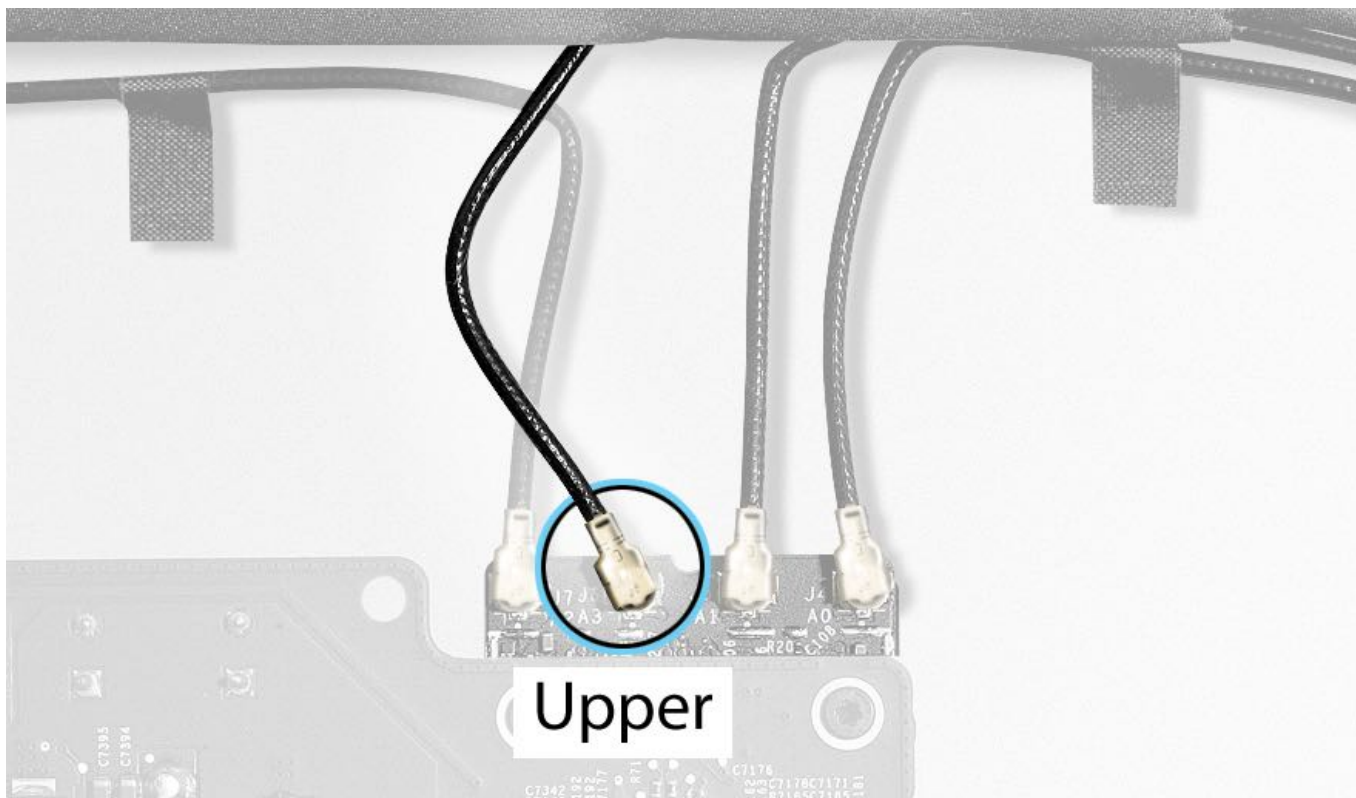


Steps For Reassembly

1. Install two (2) T4 screws (922-0337) to the Bluetooth antenna.
2. Using a black stick, adhere any pieces of mylar tape located within the airloop gasket running alongside the antenna.



2. Connect Bluetooth antenna "Upper" cable to the wireless card at position shown.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Wi-Fi Antenna, Mid

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

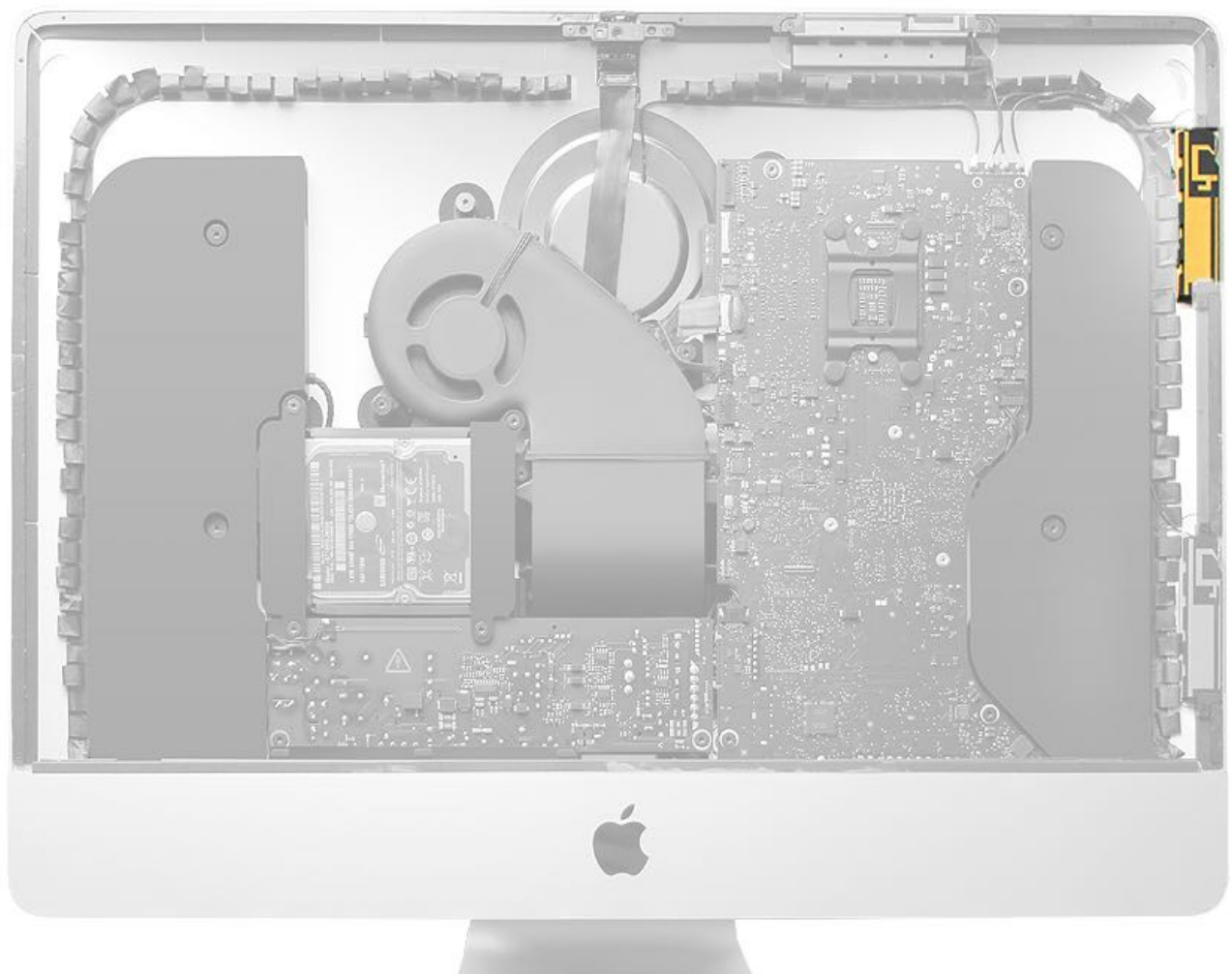
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

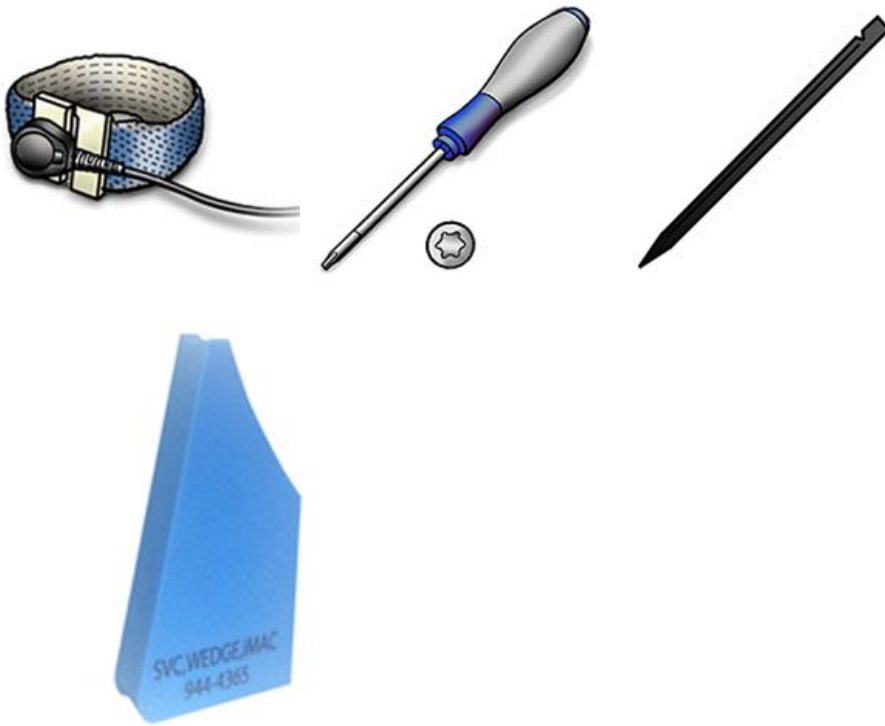
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



Tools

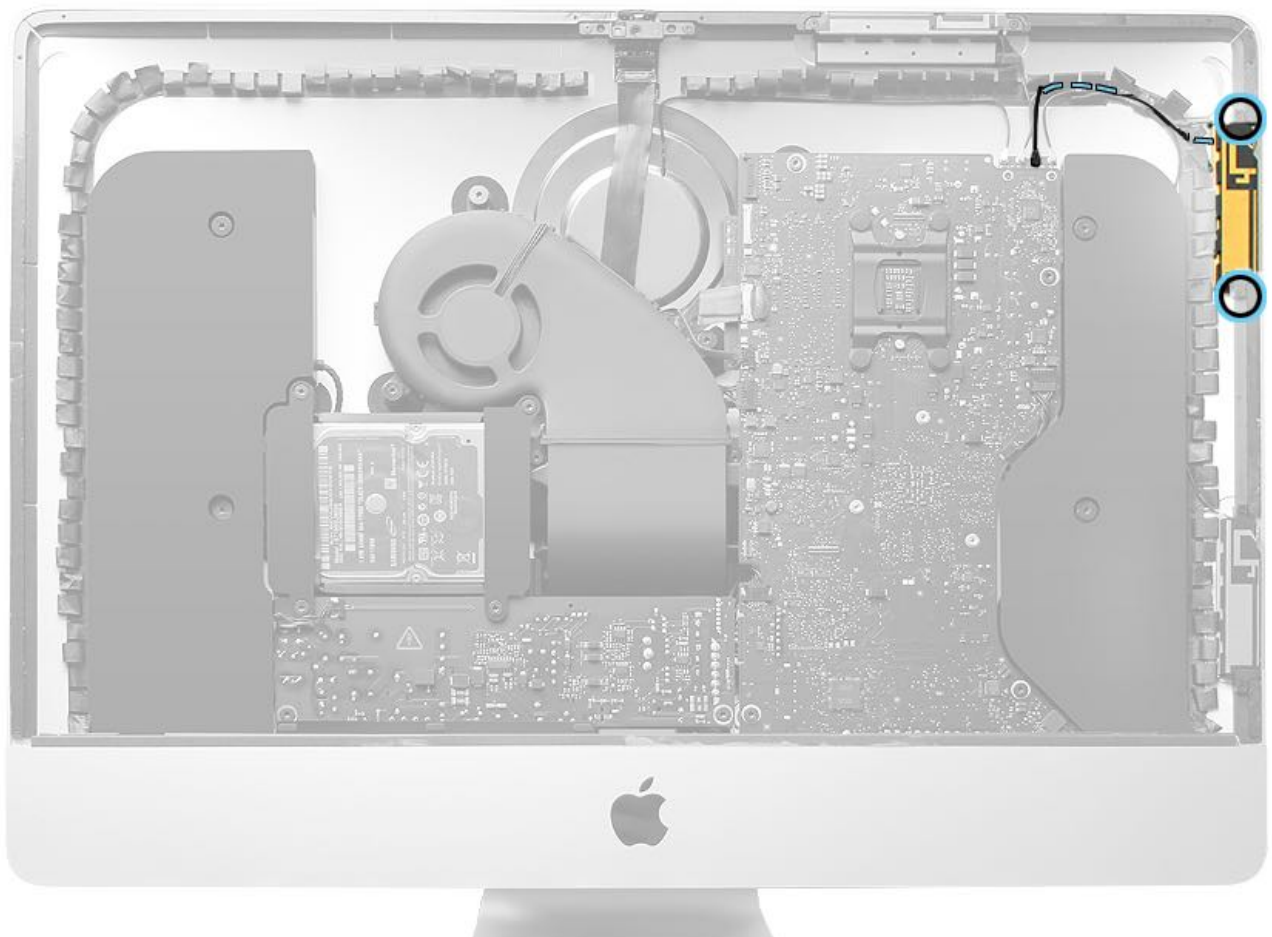
- ESD wrist strap and mat
- Magnetized Torx 4 screwdriver
- Black stick
- Service wedge, iMac



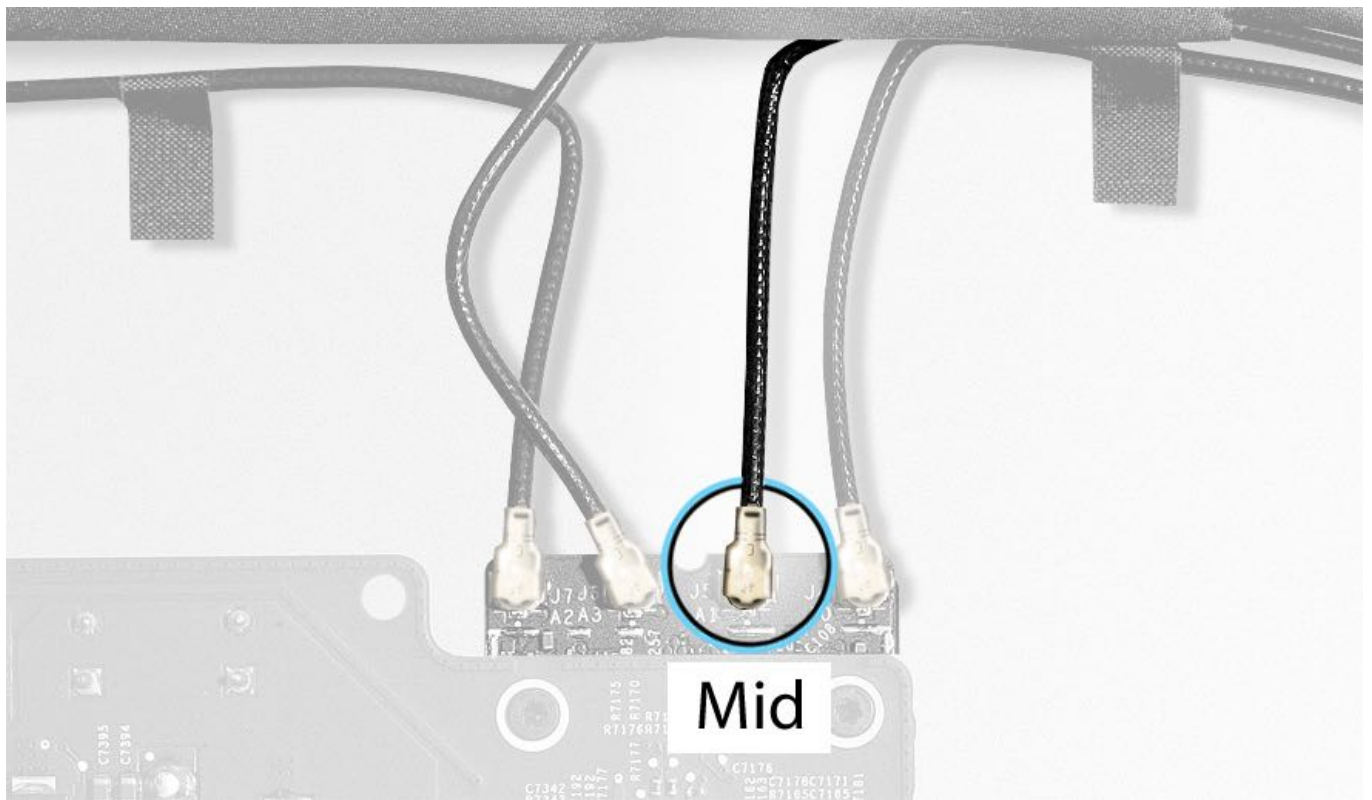
Steps For Removal

iMac (21-inch, Late 2012, Early 2013, Late 2013) has four (4) Wi-Fi/Bluetooth antennas, three (3) of which are removable. The fourth resides inside the Apple logo in the rear housing and can only be repaired by replacing the rear housing.

1. Remove two (2) T4 screws (922-0337) from the Wi-Fi antenna near the top of the right side.
2. Using a black stick, peel up the tiny pieces of mylar tape located within the airloop gasket running alongside the antenna.

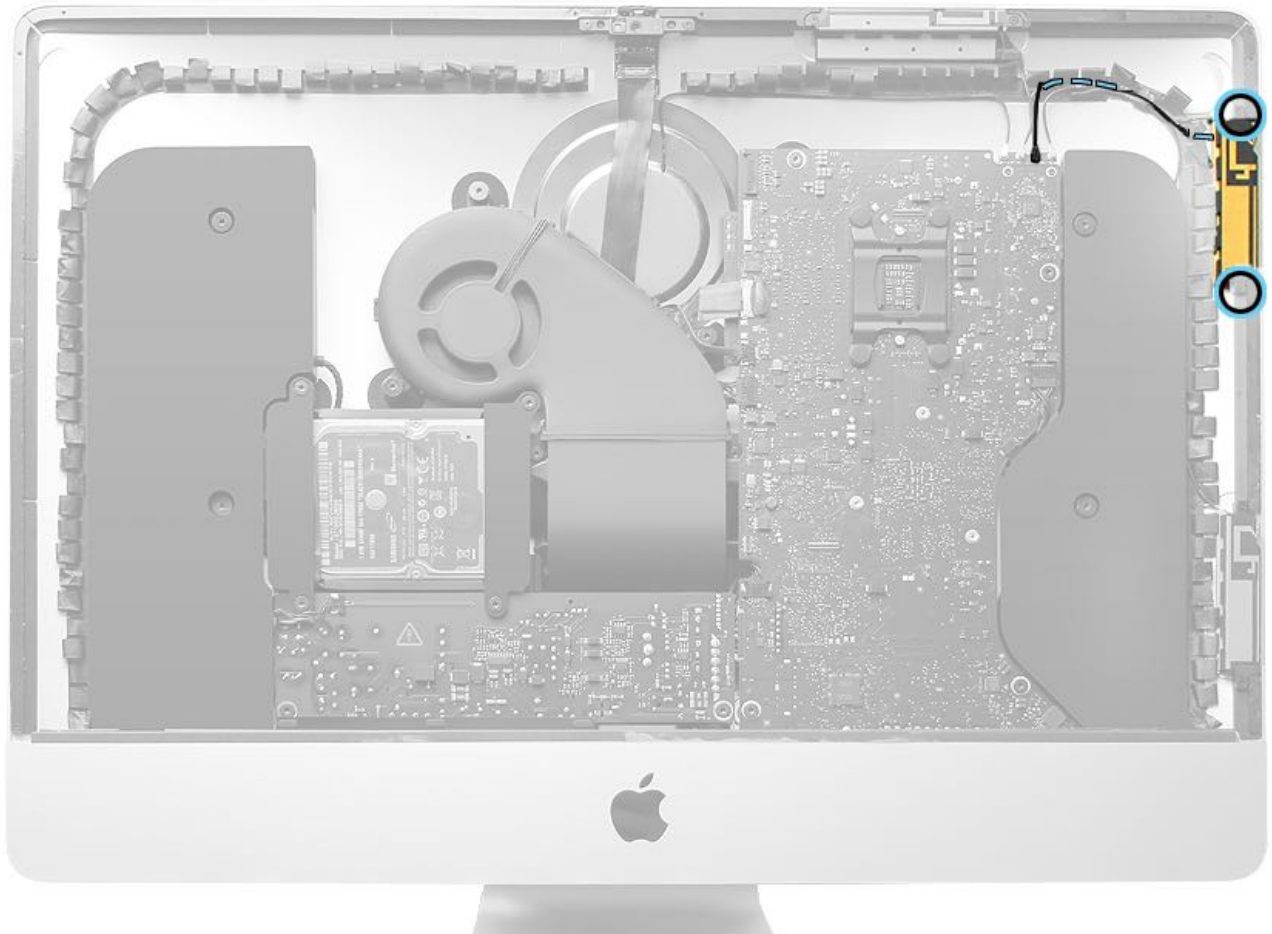


2. Disconnect Wi-Fi antenna "Mid" cable from the wireless card.

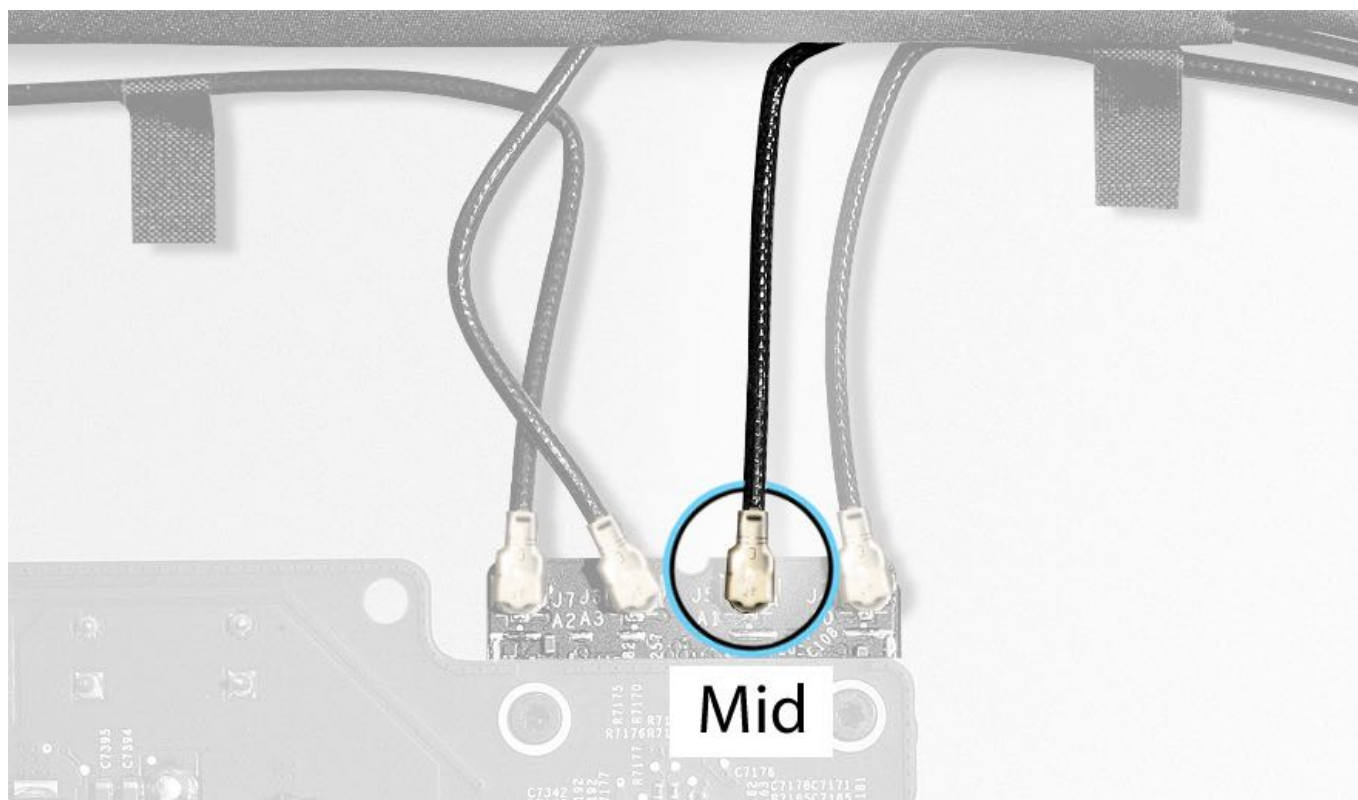


Steps For Reassembly

1. Install two (2) T4 screws (922-0337) to the Wi-Fi antenna.
2. Using a black stick, adhere any pieces of mylar tape located within the airloop gasket running alongside the antenna.



3. Connect Wi-Fi antenna "Mid" cable to wireless card at position shown.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Wi-Fi Antenna, Lower

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

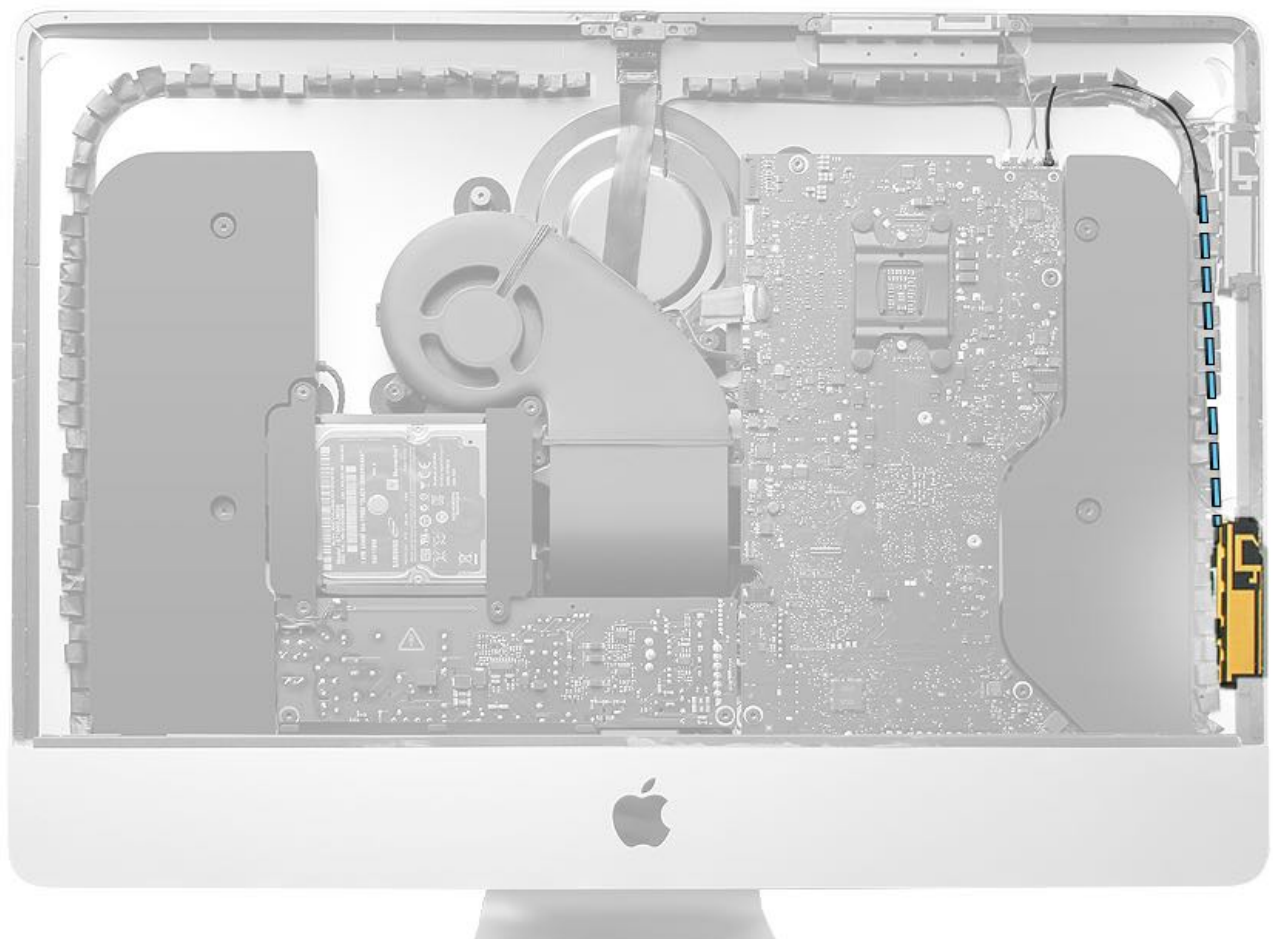
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

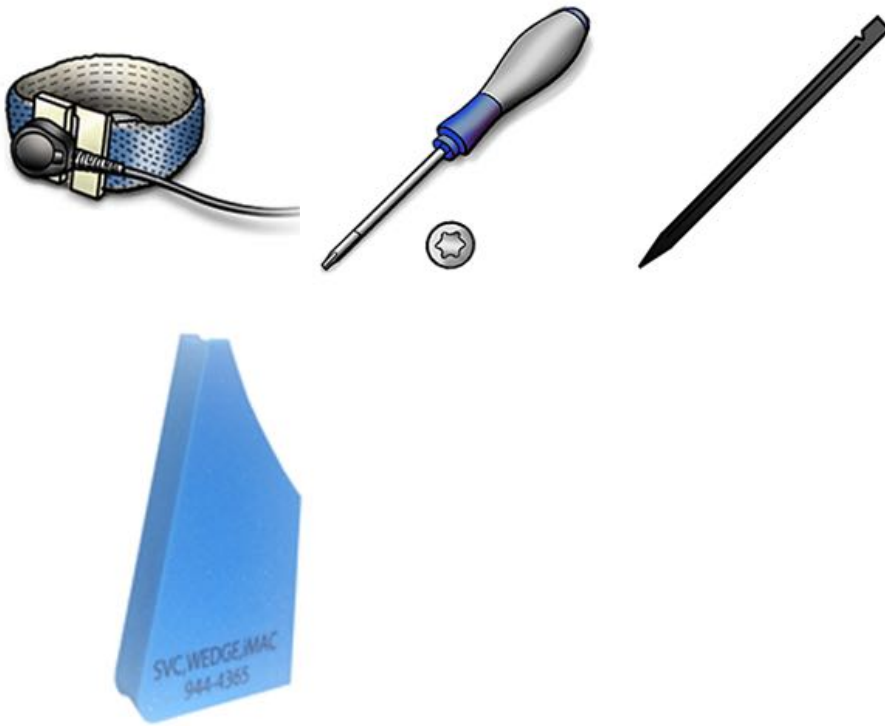
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



Tools

- ESD wrist strap and mat
- Magnetized Torx 4 screwdriver
- Black stick
- Service wedge, iMac



Steps For Removal

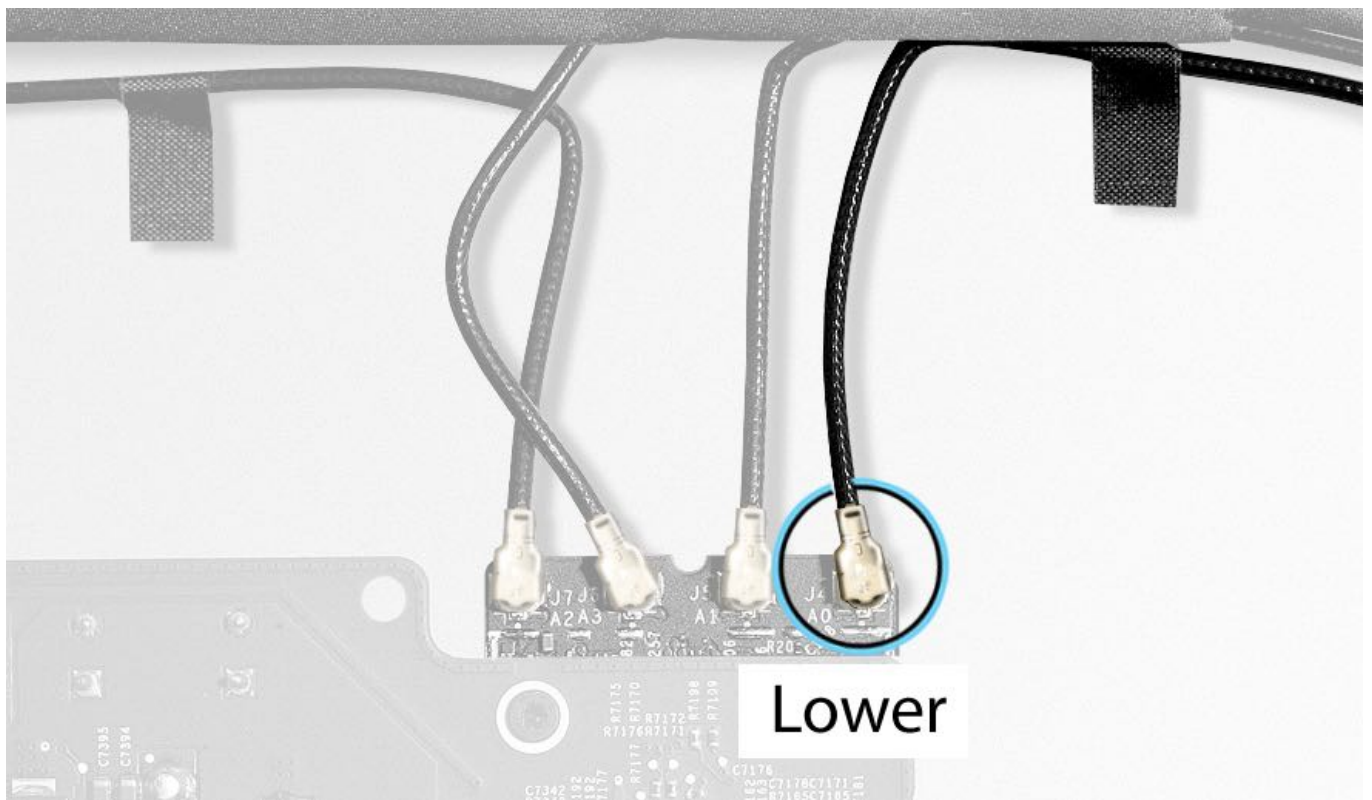
iMac (21-inch, Late 2012, Early 2013, Late 2013) has four (4) Wi-Fi/Bluetooth antennas, three (3) of which are removable. The fourth resides inside the Apple logo in the rear housing and can only be repaired by replacing the rear housing.

1. Remove two (2) T4 screws (922-0337) from the Wi-Fi antenna near the lower right side.
2. Using a black stick, peel up the tiny pieces of mylar tape located within the airloop gasket running alongside the antenna.

Note: The lower antenna cable is secured to the rear housing with a drop of ultraviolet (UV) glue. When replacing the antenna, UV glue is not required to secure the cable.



3. Disconnect Wi-Fi antenna "Lower" cable from the wireless card at position shown.

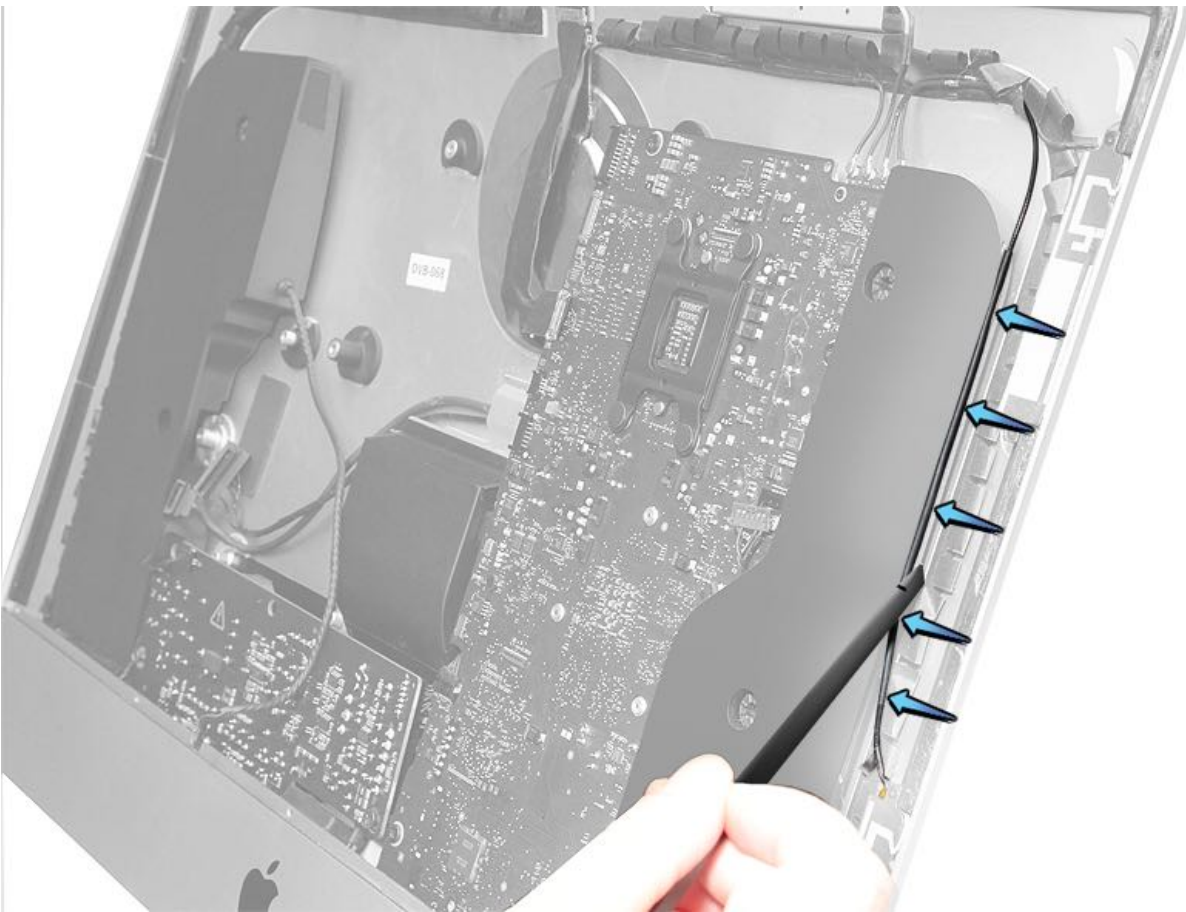


4. Remove antenna cable from right speaker channel.

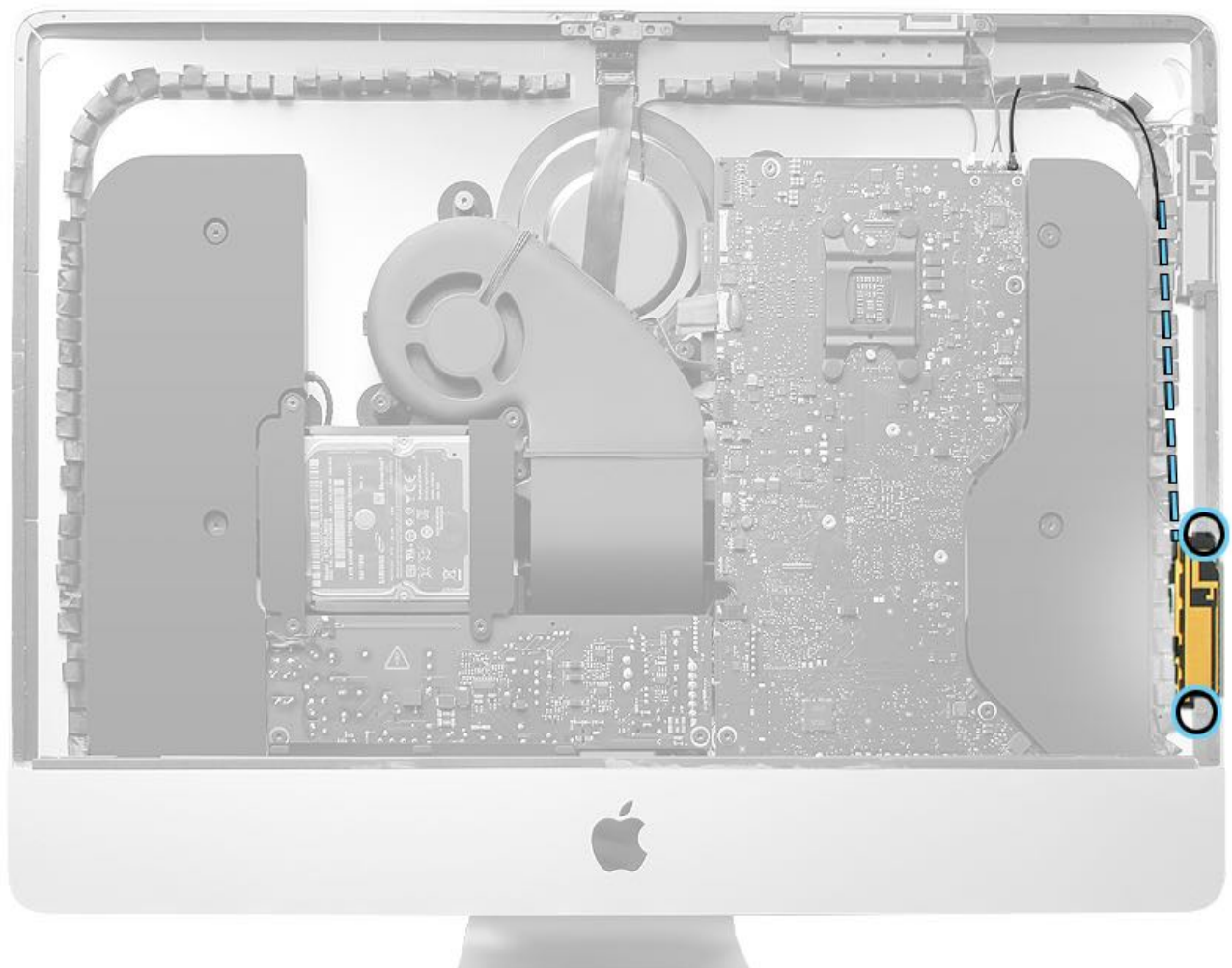


Steps For Reassembly

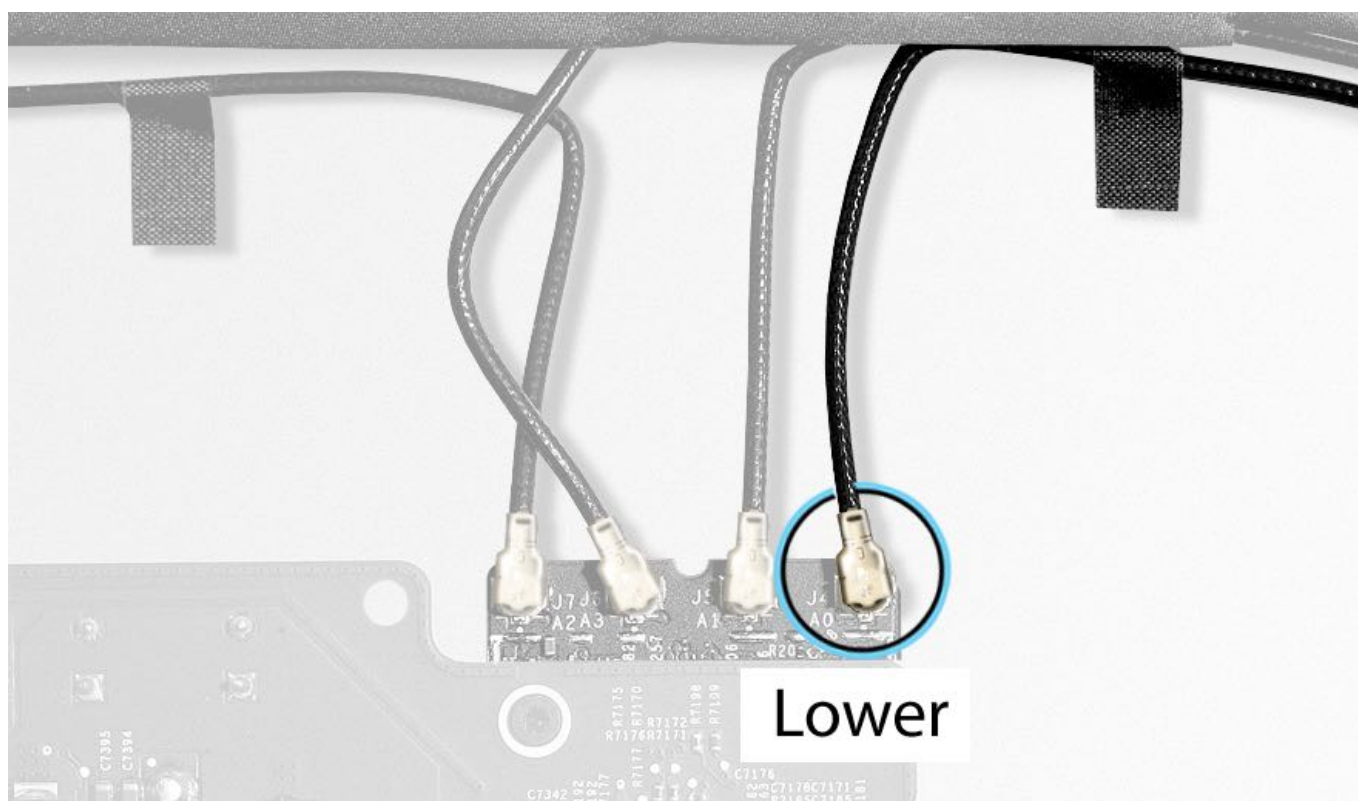
1. Carefully route Wi-Fi antenna cable inside right speaker channel. The cable is meant to fit snugly into the speaker channel, otherwise buzzing may occur when the speakers are used.



2. Install two (2) T4 screws (922-0337) to the Wi-Fi antenna near the lower right side.



3. Connect Wi-Fi antenna "Lower" cable to the wireless card at position shown.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Fan

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

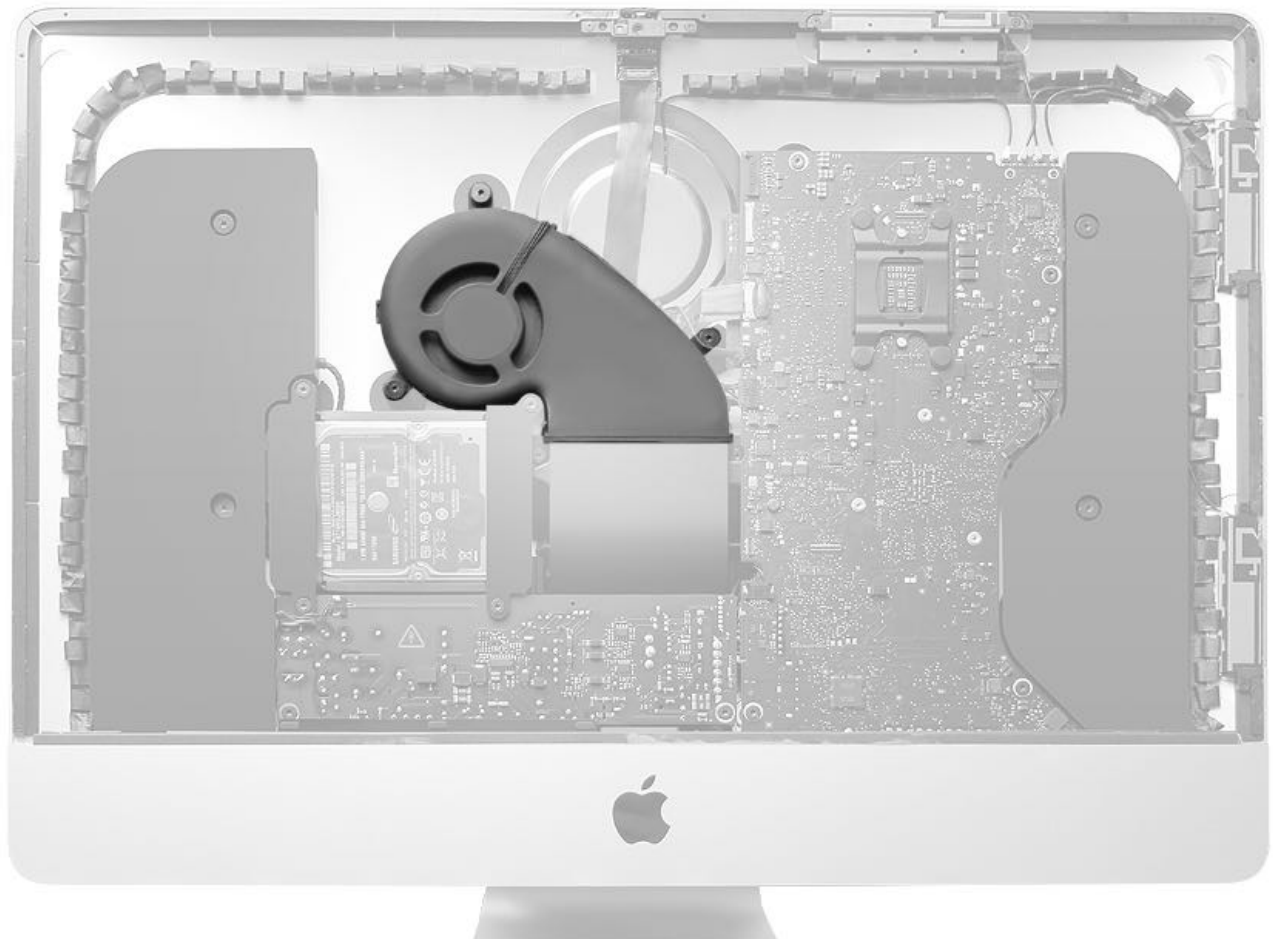
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

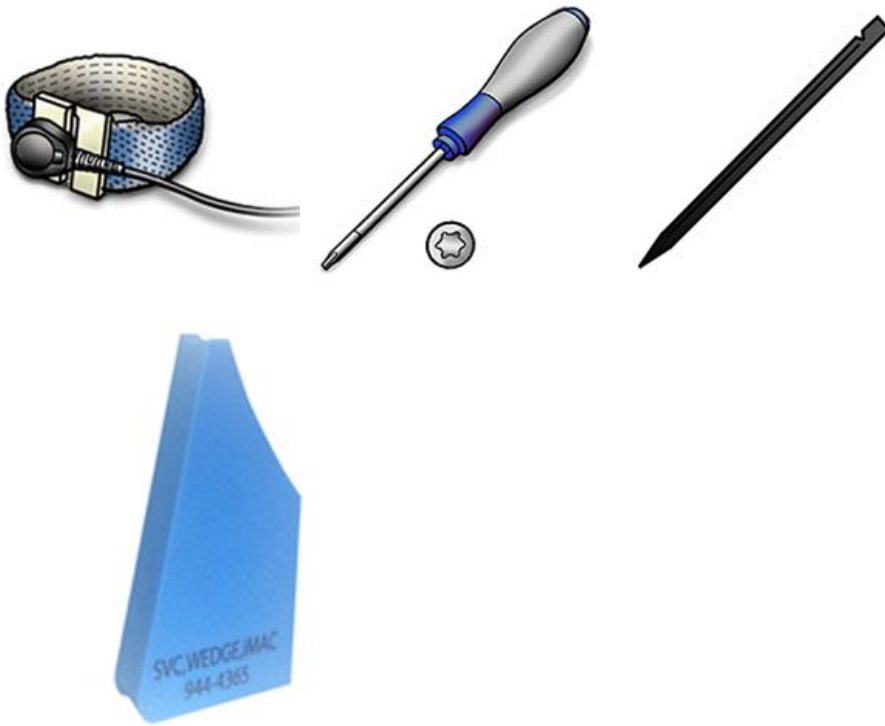
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



Tools

- ESD wrist strap and mat
- Magnetized Torx 10 screwdriver
- Black stick
- Service wedge, iMac

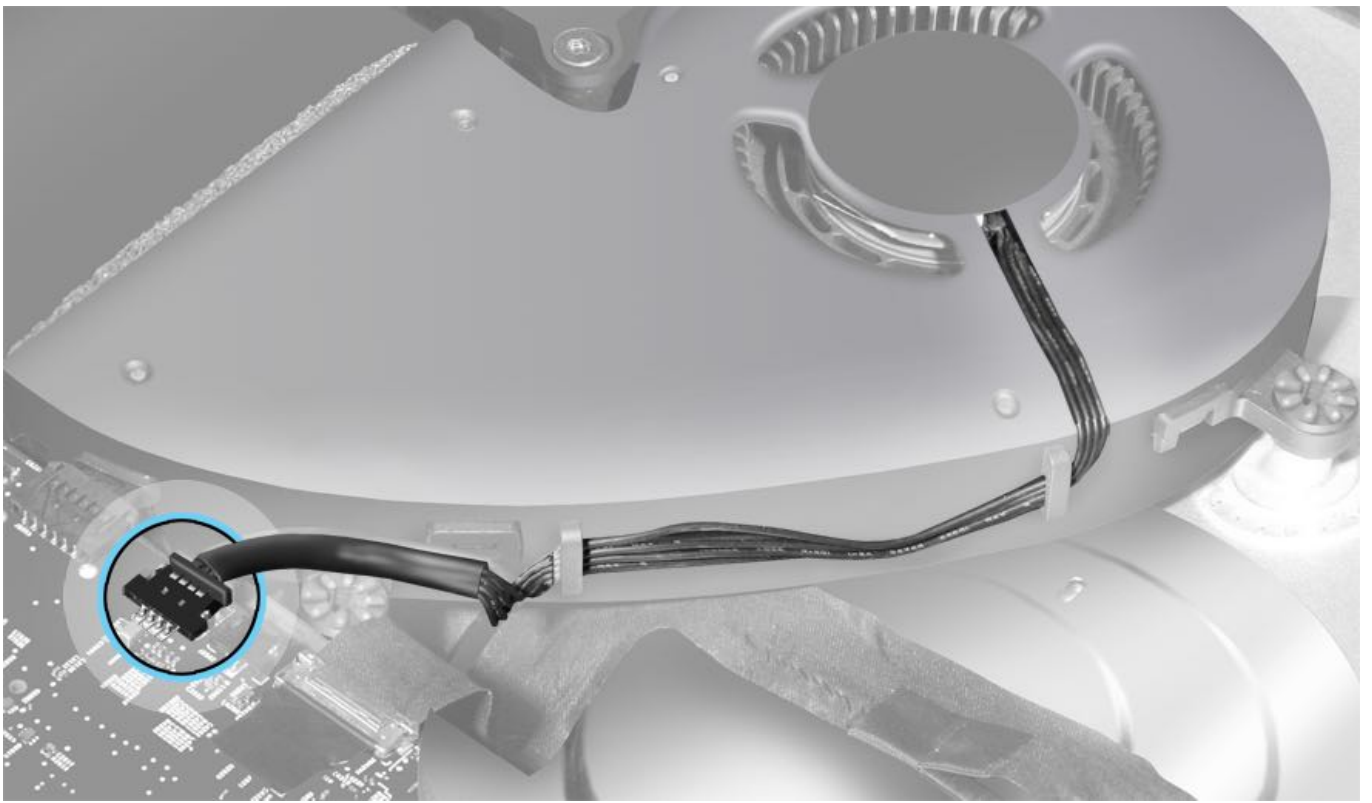


Steps For Removal

1. Remove three (3) 13mm T10 screws (923-0332) from fan.



2. Use a black stick to disconnect fan cable from logic board.

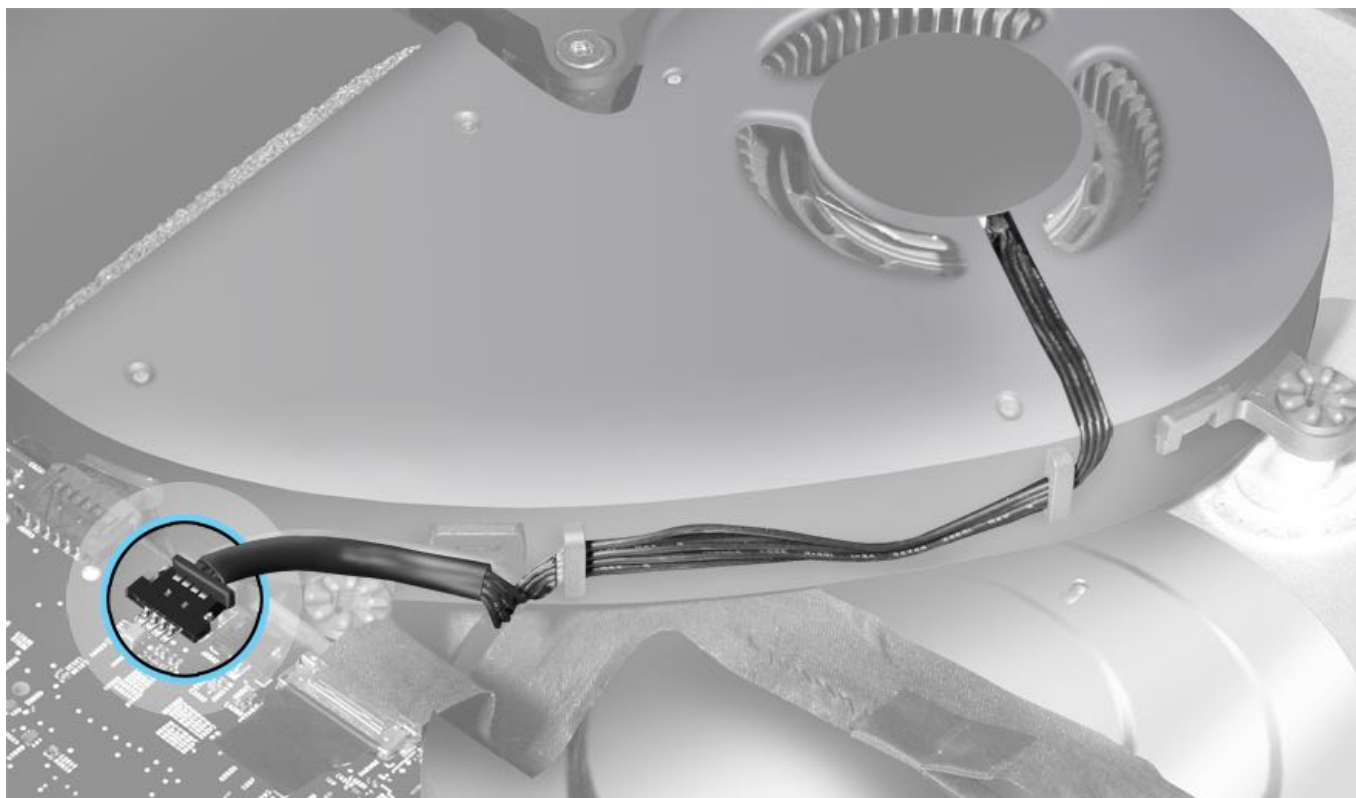


Steps For Reassembly

1. Install three (3) 13mm T10 screws (923-0332) to fan.



2. Connect fan cable to logic board. Verify cable is routed correctly.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Hard Drive Brackets

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

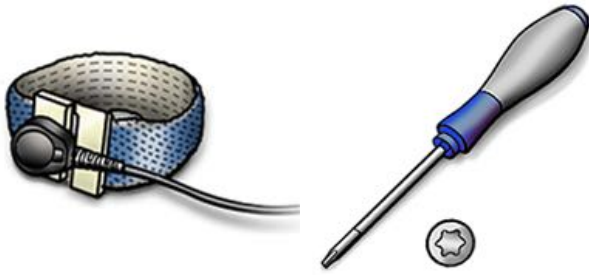
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)



Tools

- ESD wrist strap and mat
- Torx T10 screwdriver
- Service wedge, iMac



Steps For Removal

Caution: Make sure data is backed before removing the hard drive.

1. Remove four (4) T10 screws from the hard drive brackets:

- (2) 21mm T10 screws (923-0324) at left
- (1) 9mm T10 screw (923-0323) at upper right
- (1) 27mm T10 screw (923-0325) at lower right



2. Remove hard drive brackets. Image below shows brackets removed.



Steps For Reassembly

iMac (21.5-inch, Late 2012 and Early 2013): If replacing a defective hard drive cradle, left hard drive bracket, or right hard drive bracket, order kit 076-1448. The kit contains a revised hard drive cradle and new brackets. Discard original parts.

Hard Drive Cradle Kit 076-1448

1. The hard drive brackets install only one way. Be sure to orient them correctly.

Left Bracket



Right Bracket



2. Install four (4) T10 screws into the hard drive brackets:

- (2) 21mm T10 screws (923-0324) at left
- (1) 9mm T10 screw (923-0323) at upper right
- (1) 27mm T10 screw (923-0325) at lower right

3. See Apple Support article [TP767: Reinstalling Software That Came with the Computer.](#)



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Hard Drive

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

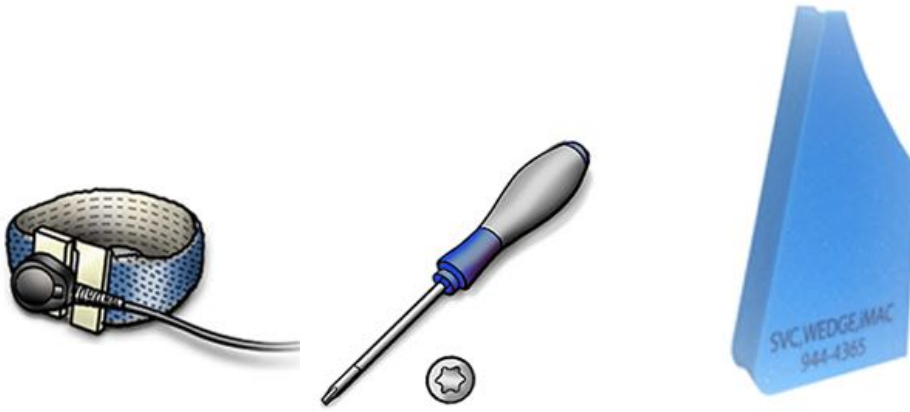
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Hard Drive Brackets](#)



Tools

- ESD wrist strap and mat
- Torx T10 screwdriver
- Service wedge, iMac



Steps For Removal

Caution: Make sure data is backed up before removing the hard drive.

1. Remove four (4) T10 screws from the hard drive brackets:

- (2) 21mm T10 screws (923-0324) at left
- (1) 9mm T10 screw (923-0323) at upper right
- (1) 27mm T10 screw (923-0325) at lower right



2. Remove hard drive brackets. Image below shows brackets removed.



iMac (21.5-inch, Late 2012 and Early 2013)

3. Disconnect two (2) cables:

- hard drive power cable
- hard drive data cable

Use a black stick to remove cables. Push up on one side, then the other side, alternating until cables release.



iMac (21.5-inch, Late 2013)

Disconnect one combo cable (hard drive power and hard drive data) from the hard drive. Use a black stick to remove the cable.



Steps For Reassembly

Mac (21.5-inch, Late 2012 and Early 2013)

1. Plug data and power cables into hard drive.



Mac (21.5-inch, Late 2013)

Plug hard drive combo cable into the hard drive.



iMac (21.5-inch, Late 2012 and Early 2013): If replacing a defective hard drive cradle, left hard drive bracket, or right hard

drive bracket, replace all three parts using service kit 076-1448. Discard the original parts. The kit contains a revised left and right bracket and hard drive cradle.

Hard Drive Cradle Kit 076-1448



2. The hard drive brackets install only one way. Be sure to orient them correctly.

Left Bracket

Right Bracket



3. Install four (4) T10 screws into the hard drive brackets:

- (2) 21mm T10 screws (923-0324) at left
- (1) 9mm T10 screw (923-0323) at upper right
- (1) 27mm T10 screw (923-0325) at lower right

4. See Apple Support article [TP767: Reinstalling Software That Came with the Computer.](#)



Portables and Desktops Late 2011 or later: Reinstalling Software That Came with the Computer

Refer to Apple Support article [HT4718: OS X: About OS X Recovery](#).

Connection to the Internet is required to complete this procedure.

Important: Apple recommends backing up data before restoring software. Back up essential files before installing OS X and other applications. Apple is not responsible for any loss of data.

1. Choose Apple menu > Restart, and then hold down the Command (⌘) and R keys while your computer restarts.
Note: To force OS X Lion or OS X Mountain Lion into Internet Recovery, press and hold the Command-Option-R key combination when starting up the computer.
2. If you're not connected to the Internet, choose a network from the Wi-Fi menu (in the top-right corner of the screen).
3. Select reinstall OS X, and then click Continue.
4. Follow the onscreen instructions. In the pane where you select a disk, select your current OS X disk (in most cases, it is the only one available).
5. To start the installation, click Install.

Check for and apply the latest software and firmware updates.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Loosen Power Supply

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

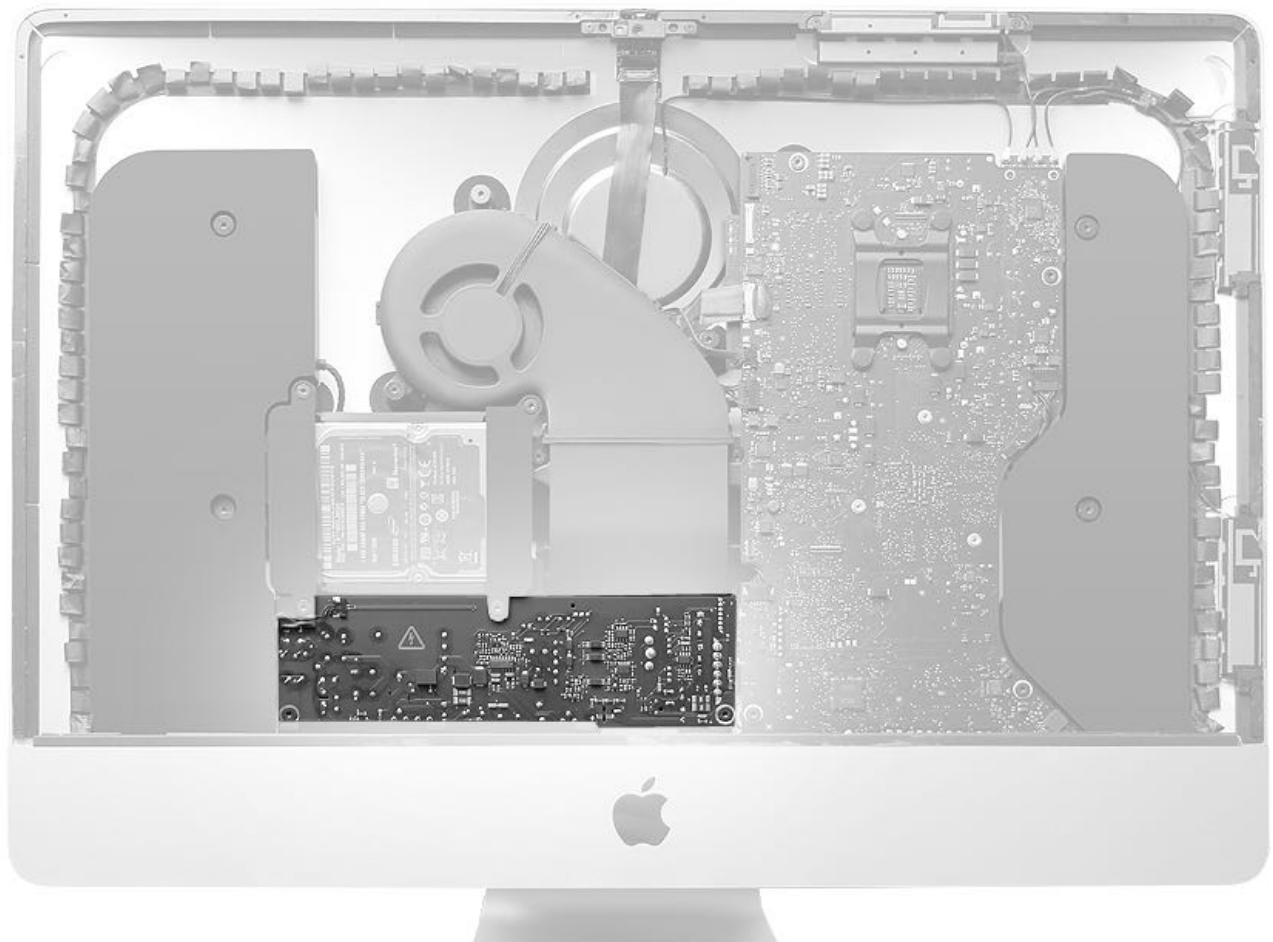
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

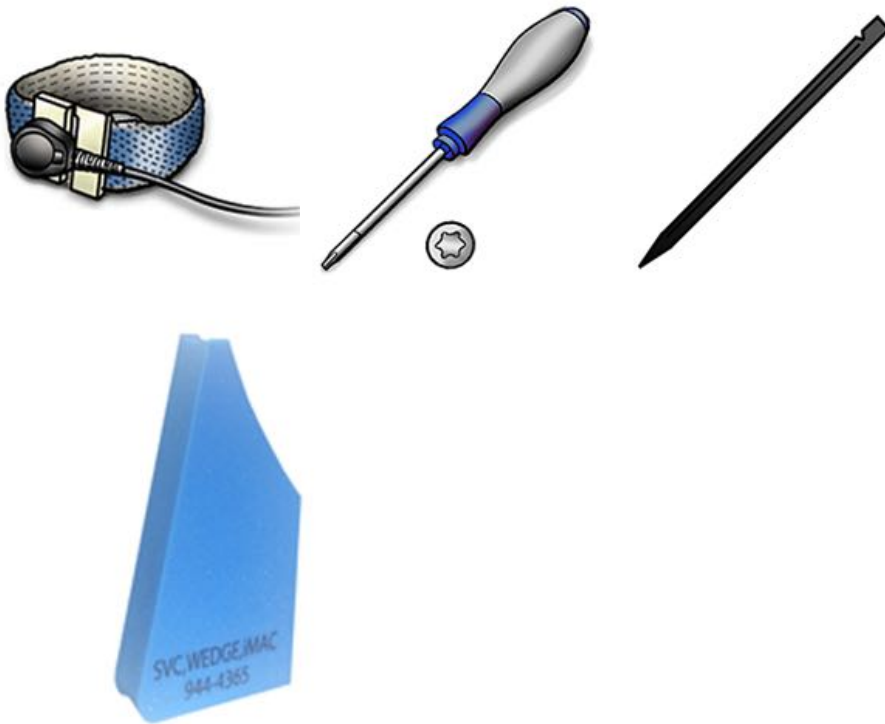
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)



Tools

- ESD wrist strap and mat
- Magnetized Torx 10 screwdriver
- Black stick
- Service wedge, iMac



Steps For Removal



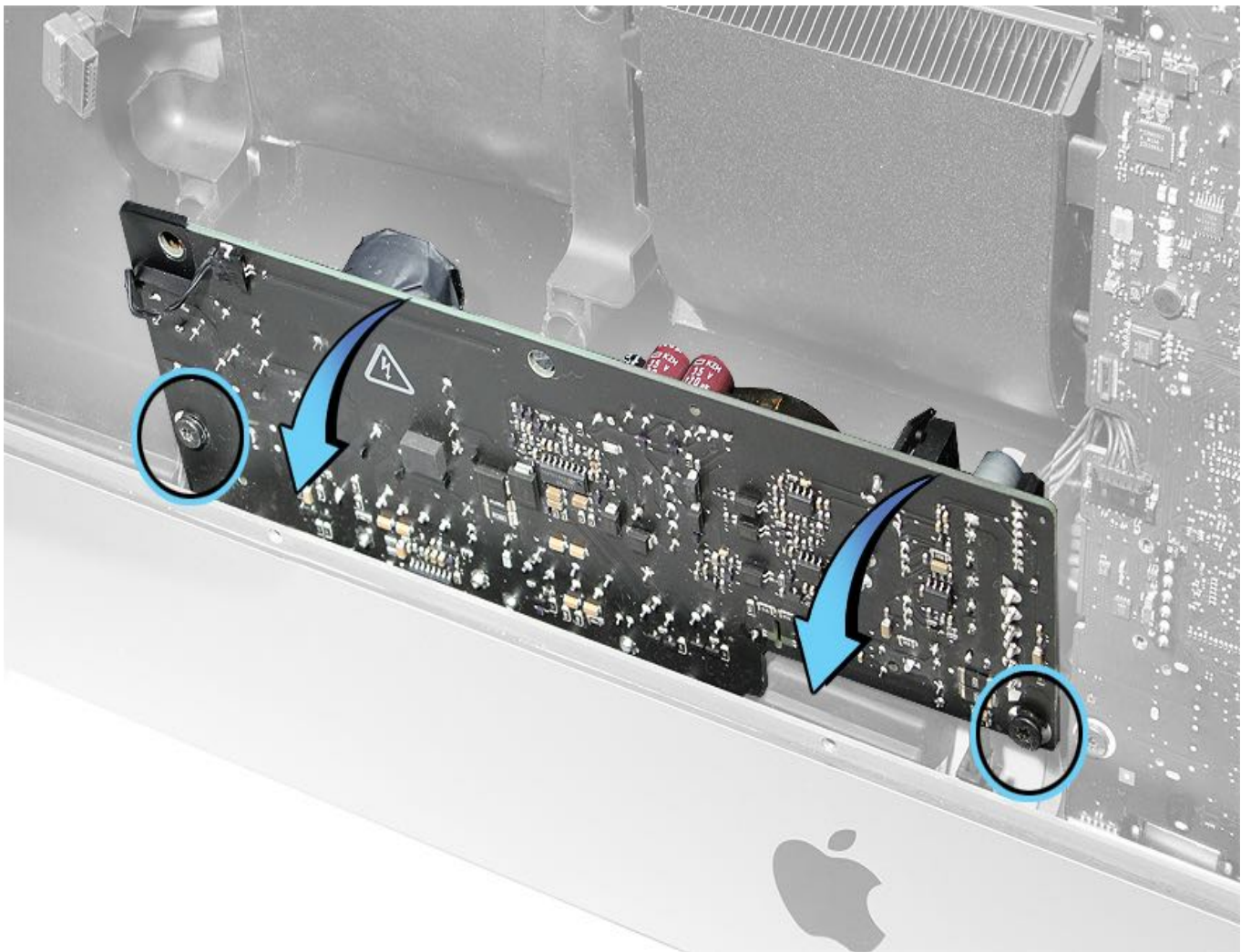
Warning: HIGH VOLTAGE: Use extreme caution when troubleshooting with the display panel removed. Avoid touching the logic board or power supply while the computer is plugged in because the power supply retains a charge whether or not the computer is on. Before working on or near the power supply, unplug the power cord from the computer and wait at least two minutes for the electricity to discharge.

- **Don't work alone.** In the event of electrical shock it is important to have another individual present who can provide assistance.
- **Keep one hand in your pocket when working on any iMac computer that is plugged in.** This will help ensure that your body does not provide a path to ground in the event that you accidentally make contact with line voltage.
- **Don't wear jewelry, watches, necklaces, or other metallic articles that could present a risk if they accidentally make contact with power supply circuitry.**

Important: Wait approximately 2 minutes after unplugging the computer from the electrical outlet before removing the power supply or working near the power supply leads. The power supply contains a high voltage capacitor that may remain charged for up to 2 minutes after unplugging the computer.

Some repairs require that the power supply screws be loosened but not removed.

1. **Loosen** two (2) 9.9mm T10 screws (923-0332) enough to allow the power supply to be lifted off of its screw bosses. **Note:** Be careful of the power button cable from top left corner of power supply. If the power button cable breaks, the rear housing will need to be replaced. The power button cable is part of the rear housing and is not available separately.



Steps For Reassembly

Reassemble in reverse order of removal steps.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Hard Drive Cradle

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

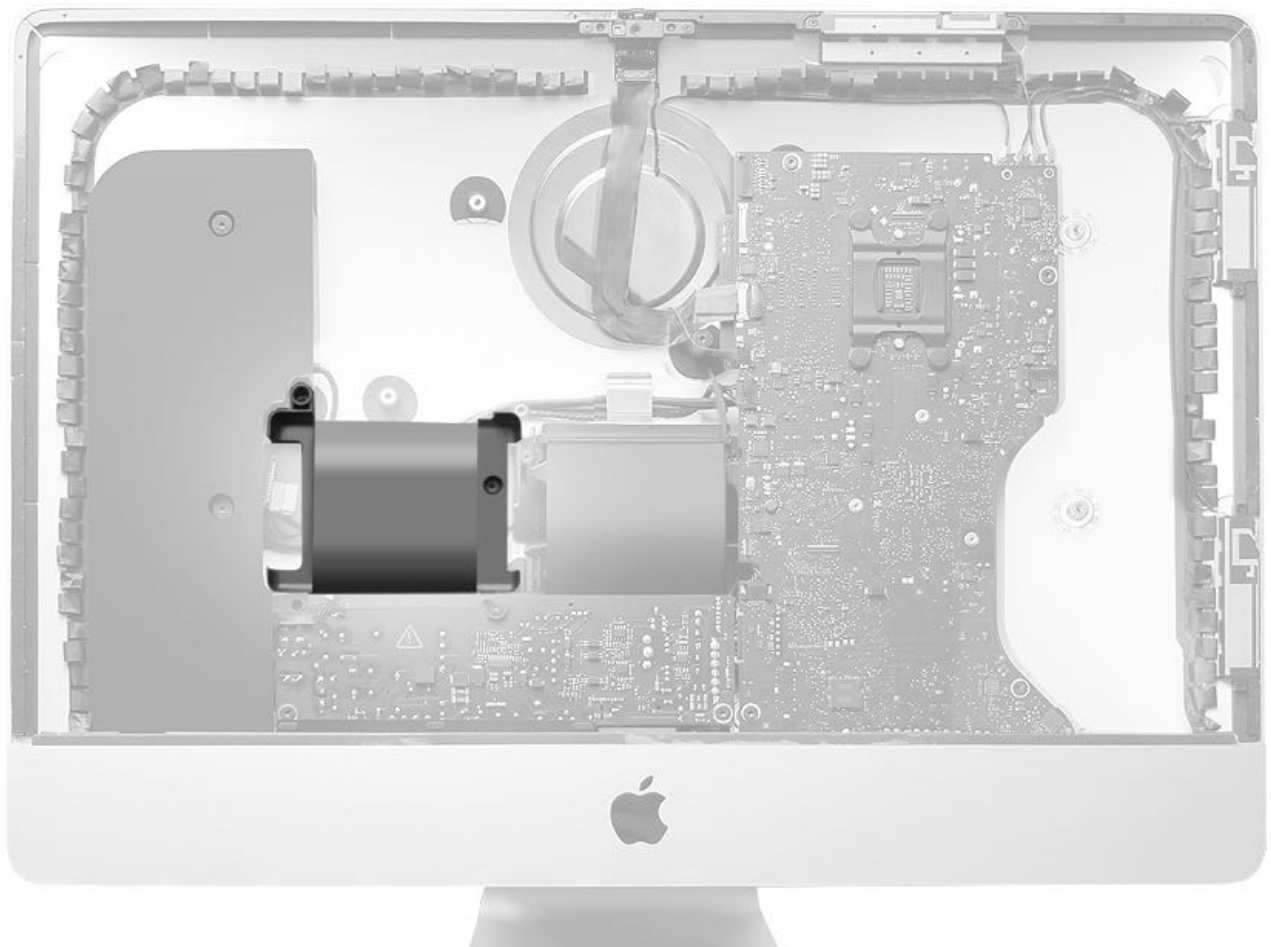
Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

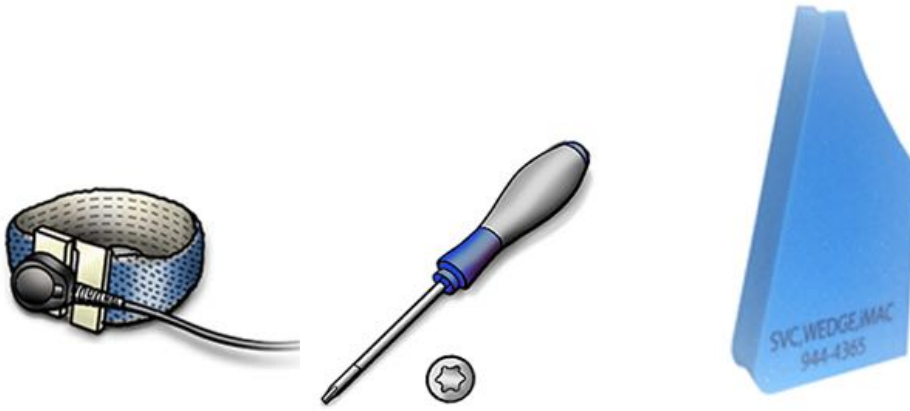
Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)



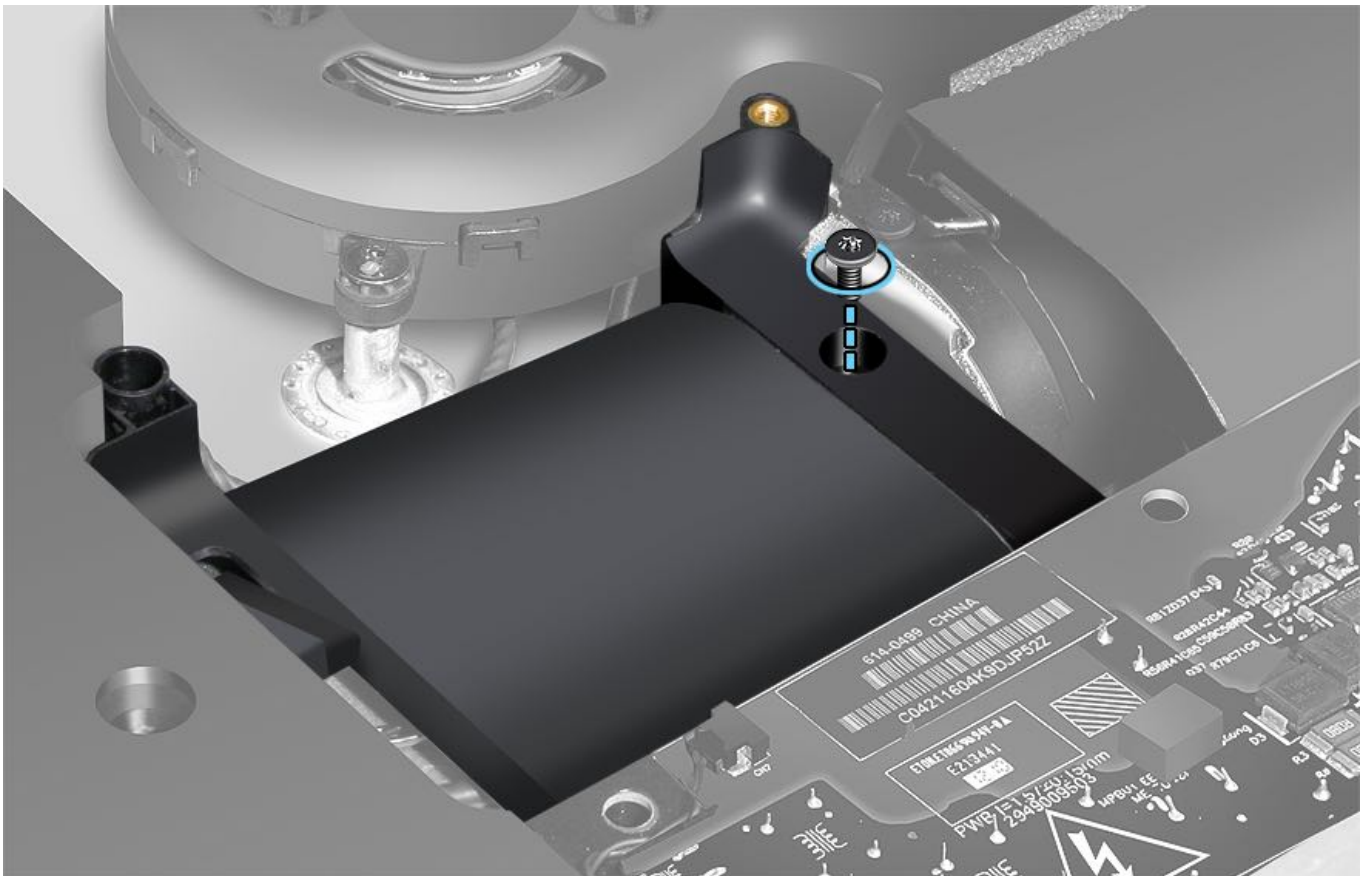
Tools

- ESD wrist strap and mat
- Magnetized Torx 9 screwdriver
- Magnetized Torx 10 screwdriver
- Service wedge, iMac

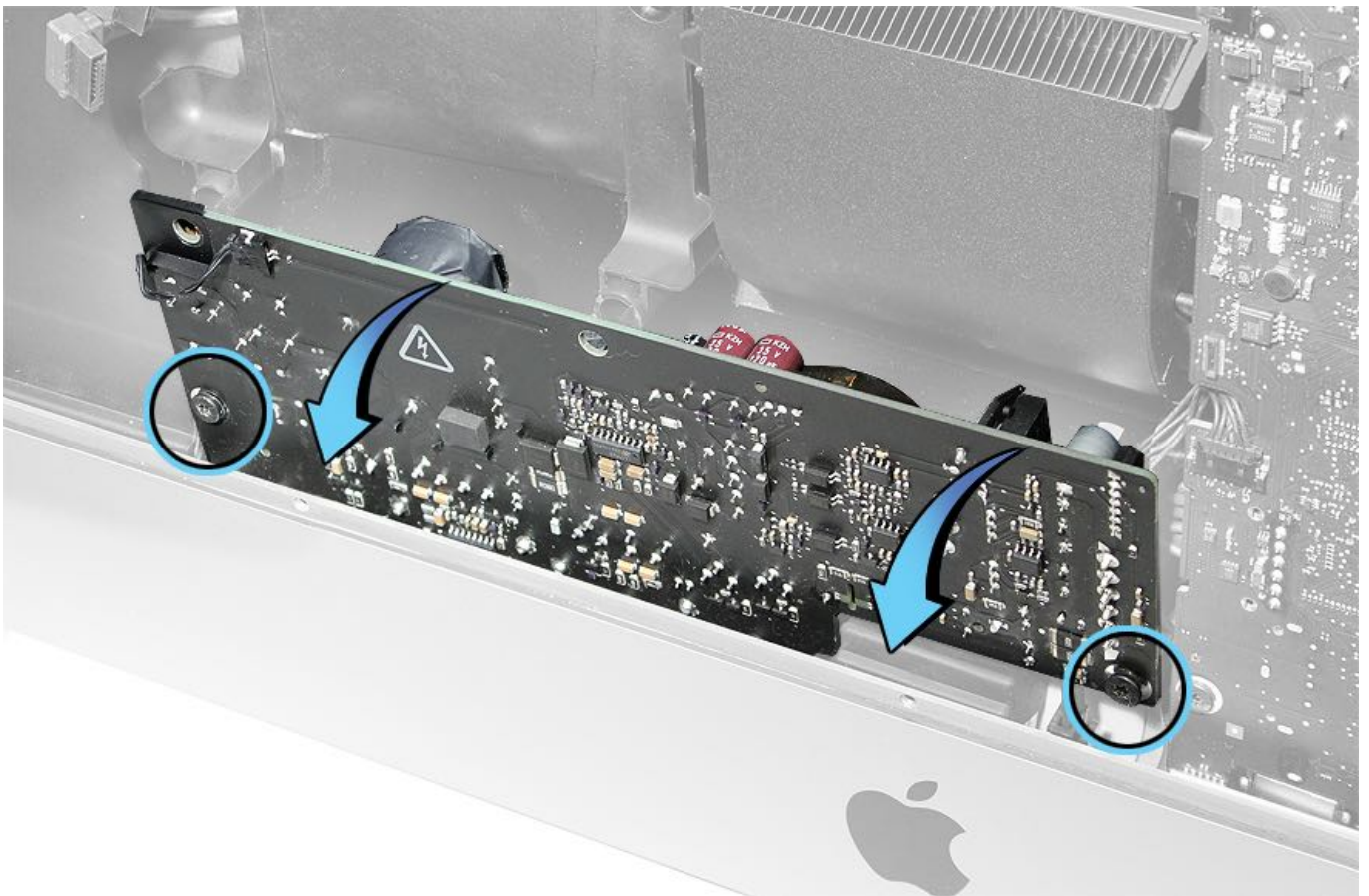


Steps For Removal

1. Remove one (1) 7.2mm T10 screw (923-0331) from the hard drive cradle.



2. Loosen two (2) 9.9mm T10 screws (923-0332) on power supply. **Note:** Be careful not to break the power button cable connected in the top left corner of the power supply. The power button cable is part of the rear housing and is not available separately.



3. Pull the hard drive cradle up and over the screw boss.

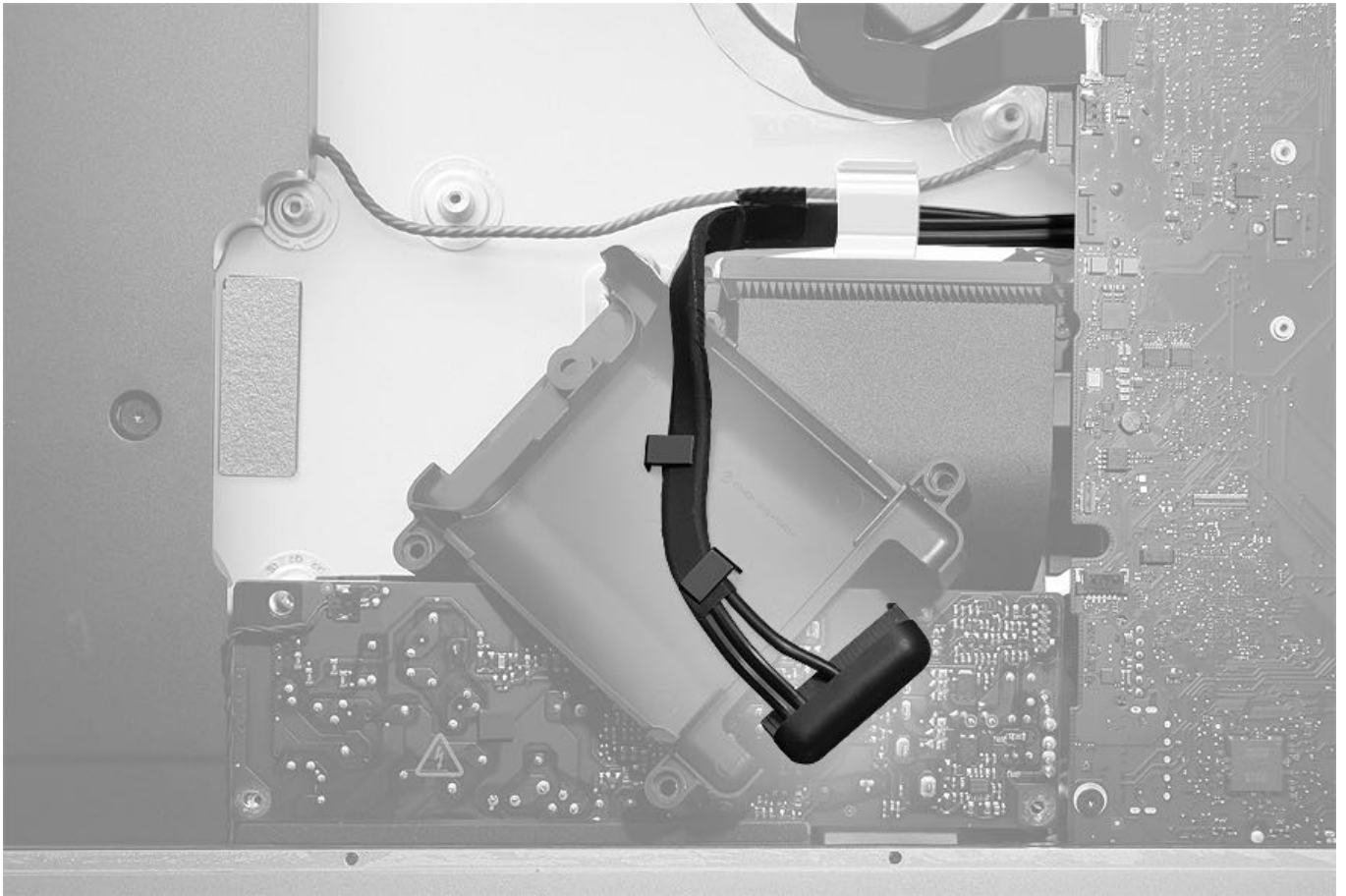
4. Disengage hard drive data cable and hard drive power cable from underside of hard drive cradle.

iMac (21.5-inch, Late 2012 and Early 2013)



iMac (21.5-inch, Late 2013)

Disengage the combo cable from underside of hard drive cradle.



Steps For Reassembly

iMac (21.5-inch, Late 2012 and Early 2013): If replacing a defective hard drive cradle, left hard drive bracket, or right hard drive bracket, replace all three parts using service kit 076-1448. Discard the original parts. The kit contains a revised left and right bracket and hard drive cradle.

Hard Drive Cradle Kit 076-1448



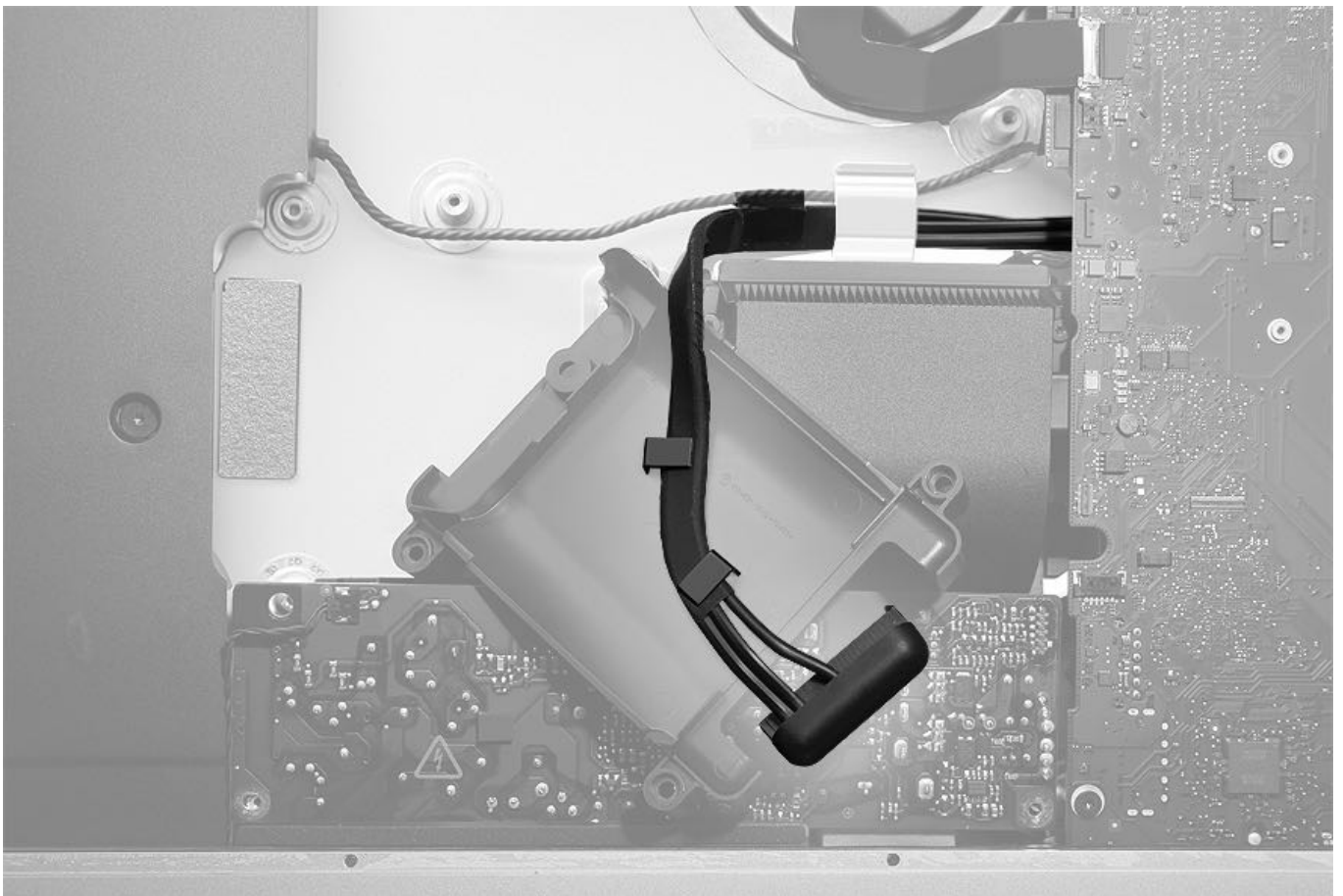
1. Lift power supply and ease hard drive cradle over screw boss.
2. Route hard drive data cable and hard drive power cable through the underside of hard drive cradle.

iMac (21.5-inch, Late 2012 and Early 2013)



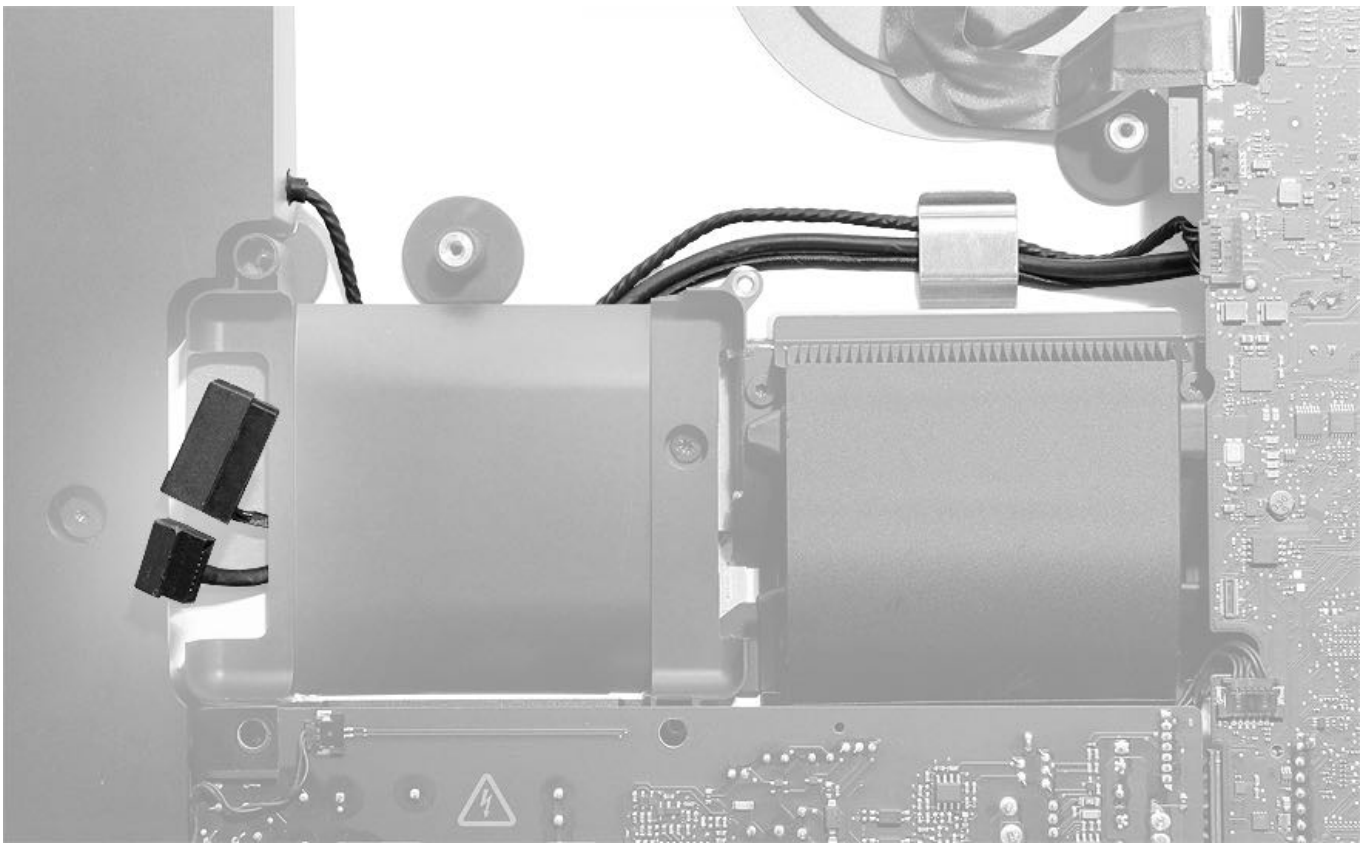
iMac (21.5-inch, Late 2013)

Route combo cable through the clips on the underside of hard drive cradle.

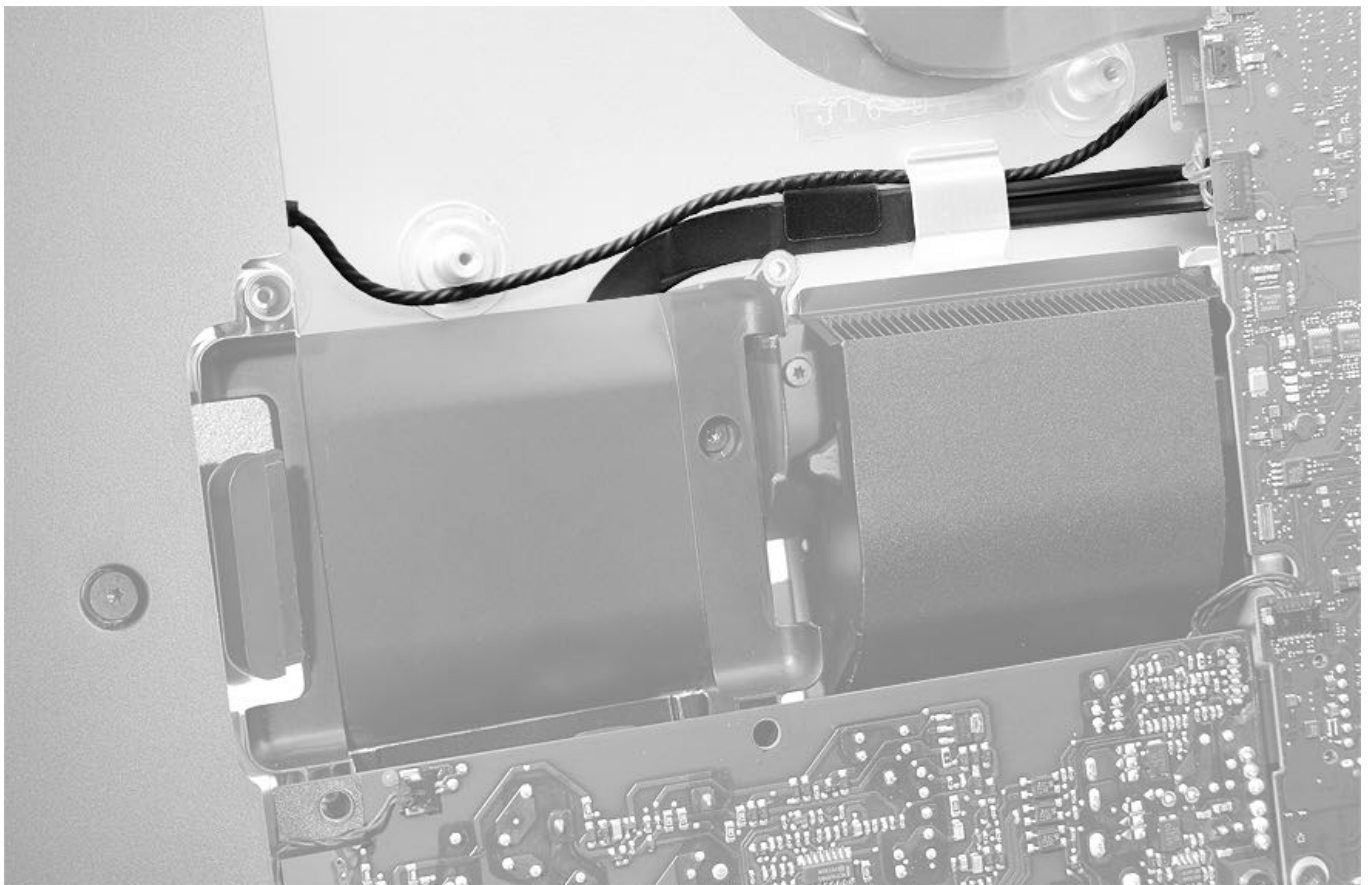


Caution: Be careful not to pinch cables under the hard drive cradle.

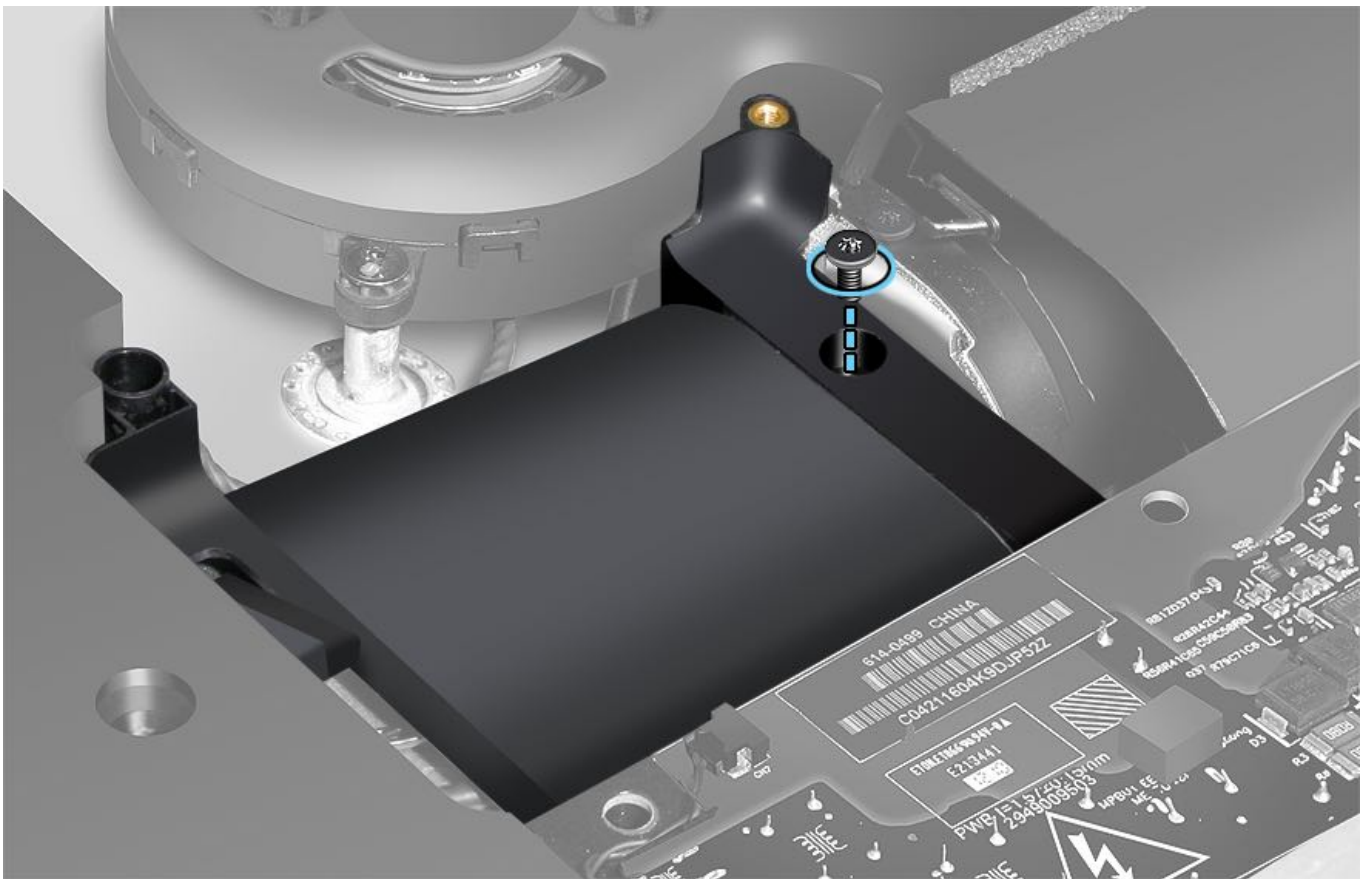
iMac (21.5-inch, Late 2012, Early 2013)



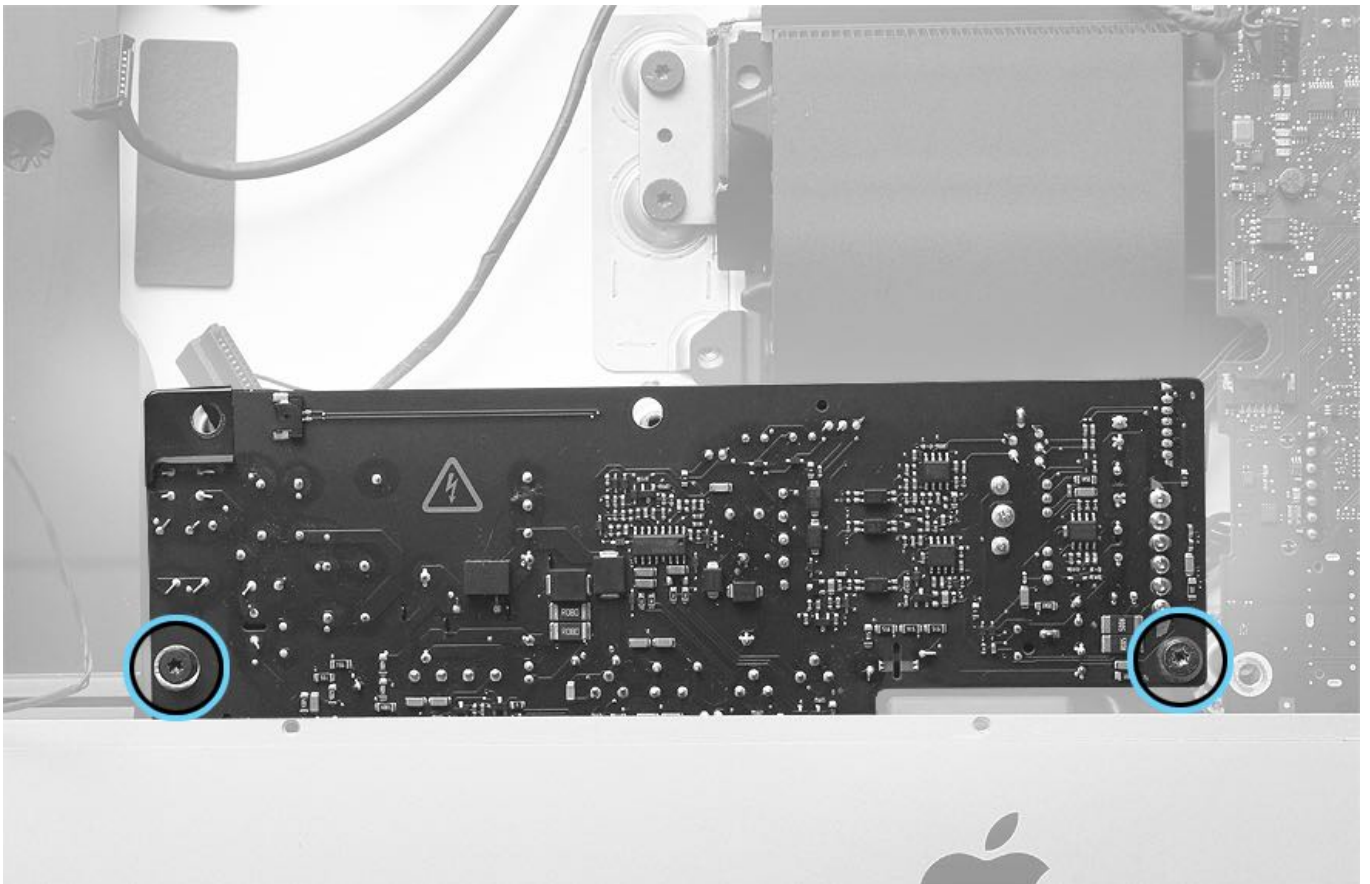
iMac (21.5-inch, Late 2013)



3. Install one (1) 7.2mm T10 screw (922-0331) to the hard drive cradle.



4. Tighten two (2) 9.9mm T10 screws (923-0332) on power supply.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Chin Strap

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

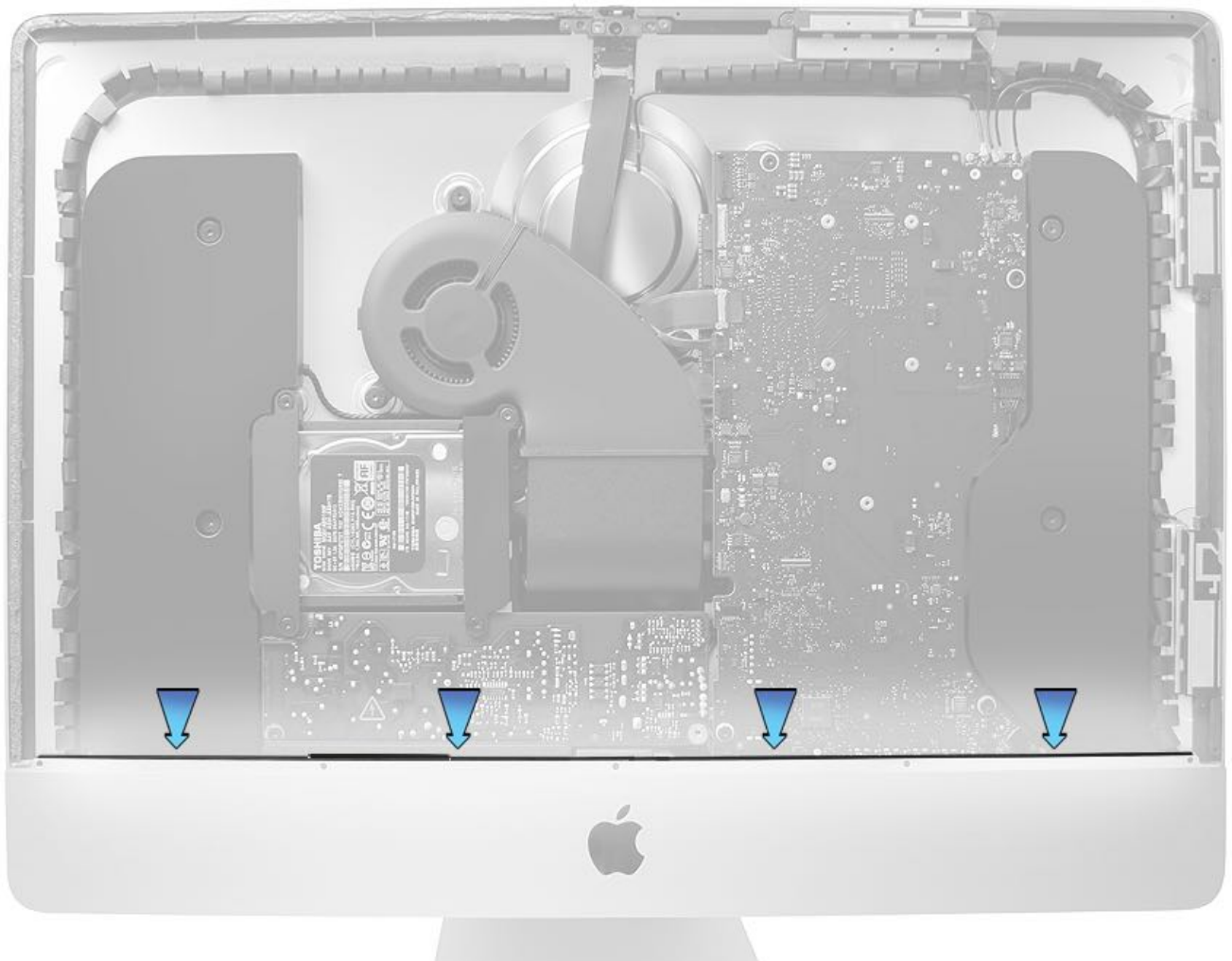
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

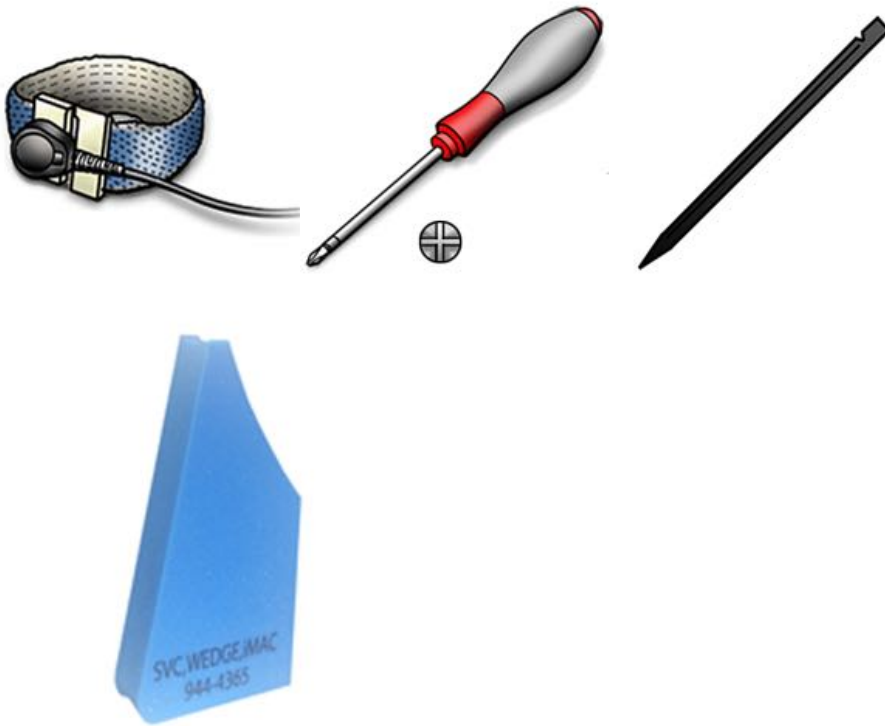
- [Display Panel](#)
- [Display Panel VHB Strips](#)

Important: The chin strap must be removed in order to repair any component that sits below the chin.



Tools

- ESD wrist strap and mat
- Magnetized Phillips #00 screwdriver
- Black stick
- Service wedge, iMac



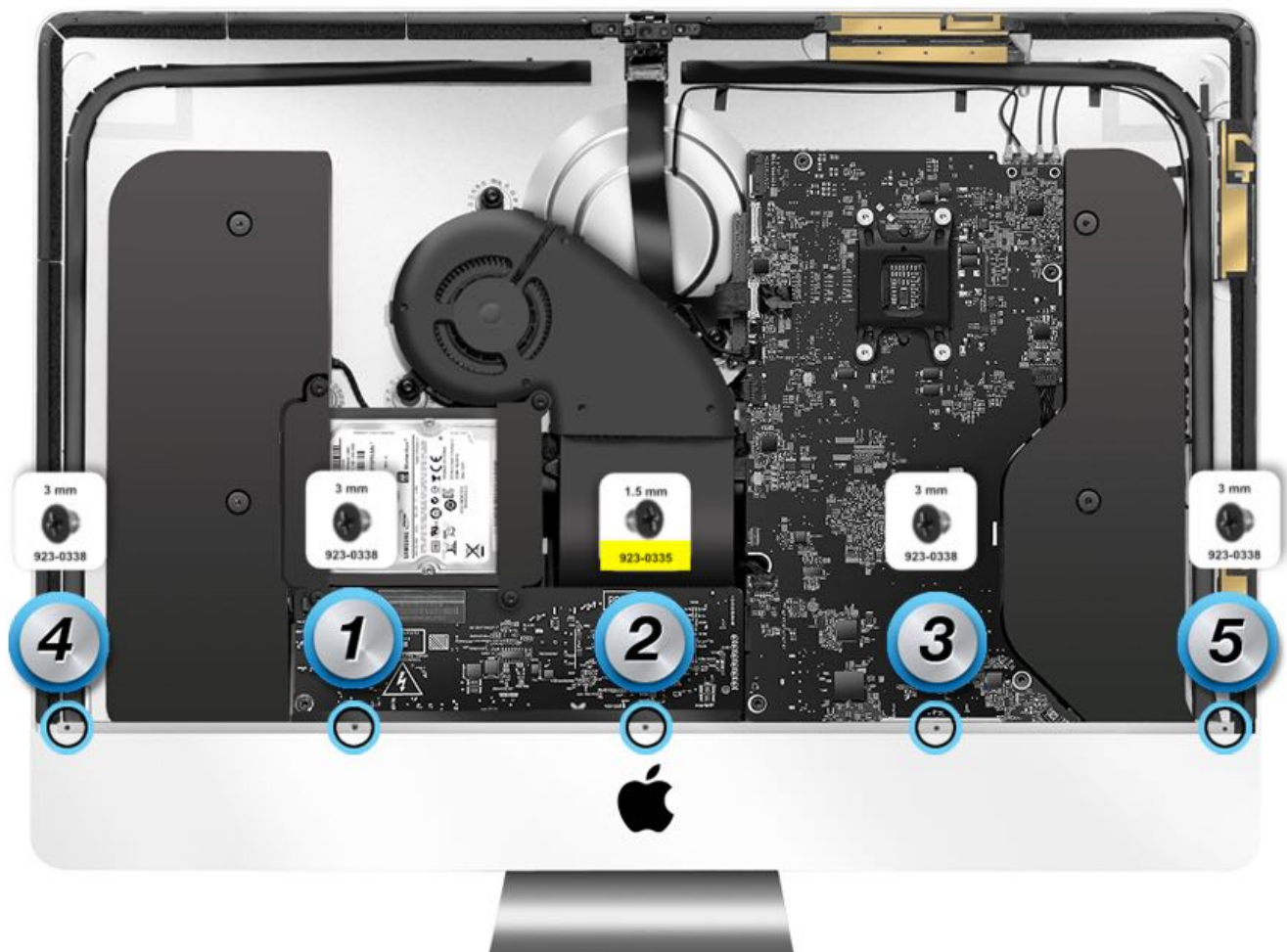
Steps For Removal

Note: Chin strap screws are very small. There are four (4) longer screws and one (1) short screw. Short screw is in the center hole.

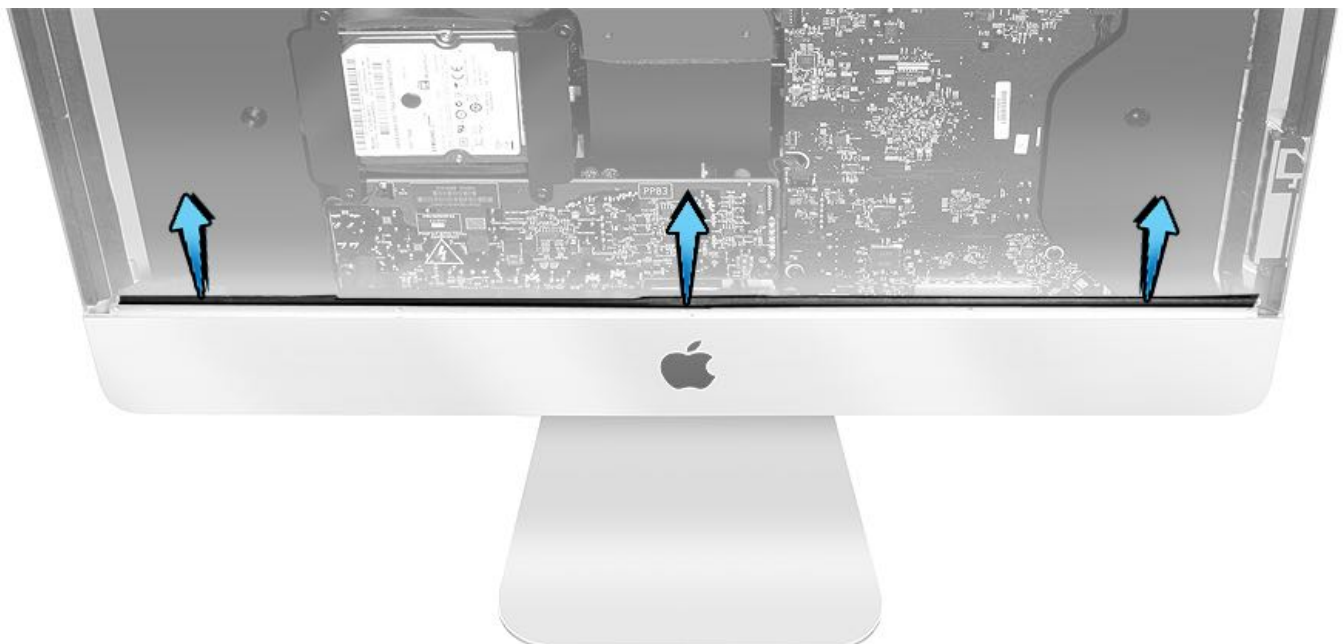
1. Remove:

- (4) 3mm Phillips #00 screws (923-0338)
- (1) 1.5mm Phillips #00 center screw (923-0335)

in the following order:



2. Gently pull the chin strap out of the chin.



Steps For Reassembly

1. Insert chin strap. Be sure the screw holes point outward toward the front of the computer. The mylar ridge should be positioned towards the left.

iMac (21.5-inch, Late 2012 and Early 2013)



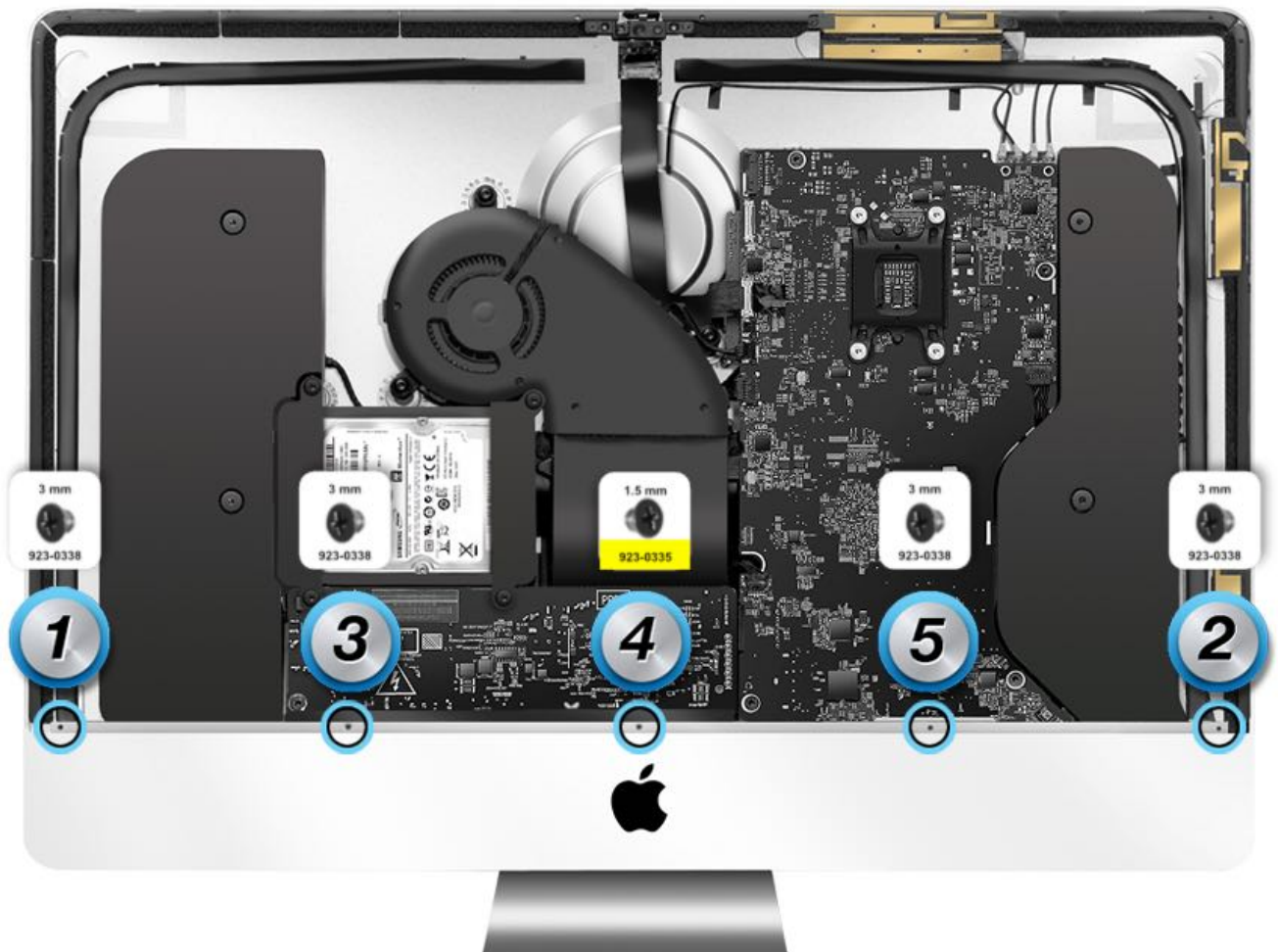
iMac (21.5-inch, Late 2013)

Note: Chin strap screws are very small. There are four (4) longer screws and 1 short screw. Install the short screw in the center hole.

2. Install:

- (4) 3mm Phillips #00 screws (923-0338)
- (1) 1.5mm Phillips #00 center screw (923-0335)

in the following order:



Note: The screws are very small and challenging to install. Use a black stick to press the chin strap against the front frame if needed. **DO NOT** press on the chin. **Always** press on the back of the chin strap to bring it toward the screw.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Left Speaker

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

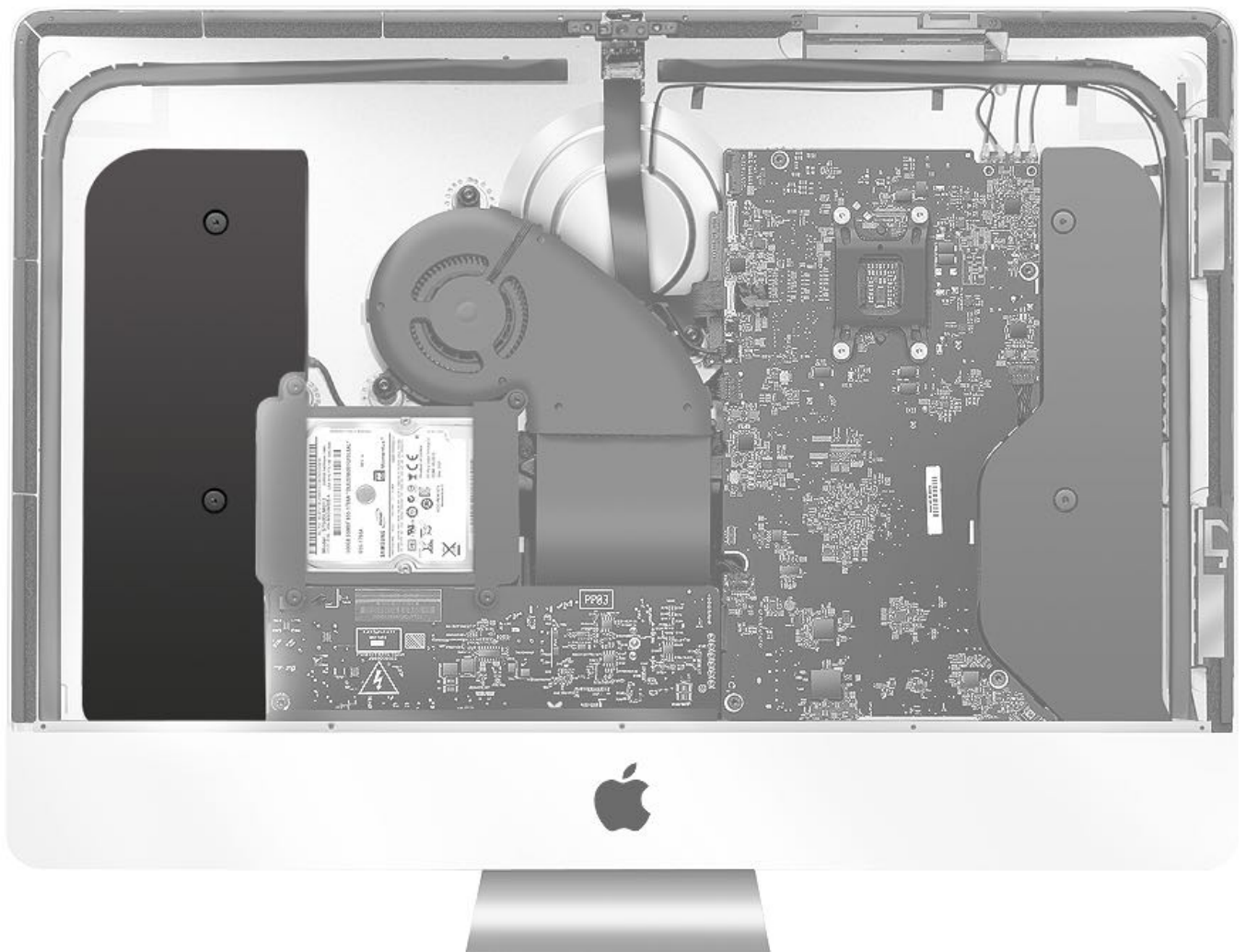
Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)

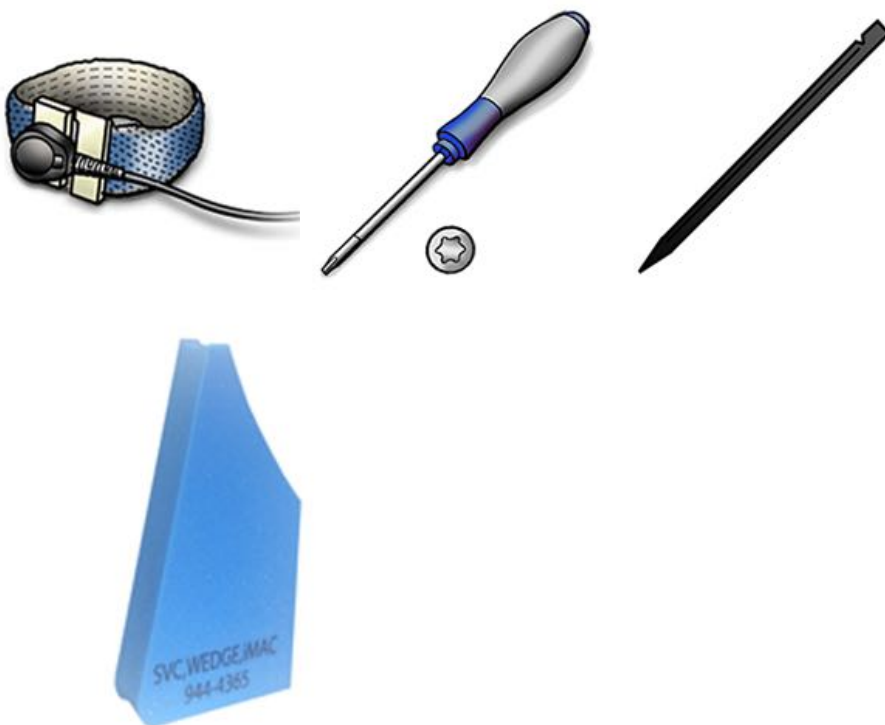
Note: The chin strap must be removed for this repair.

Important: Speakers must be replaced in pairs. If you replace the left speaker you must also replace the right speaker.



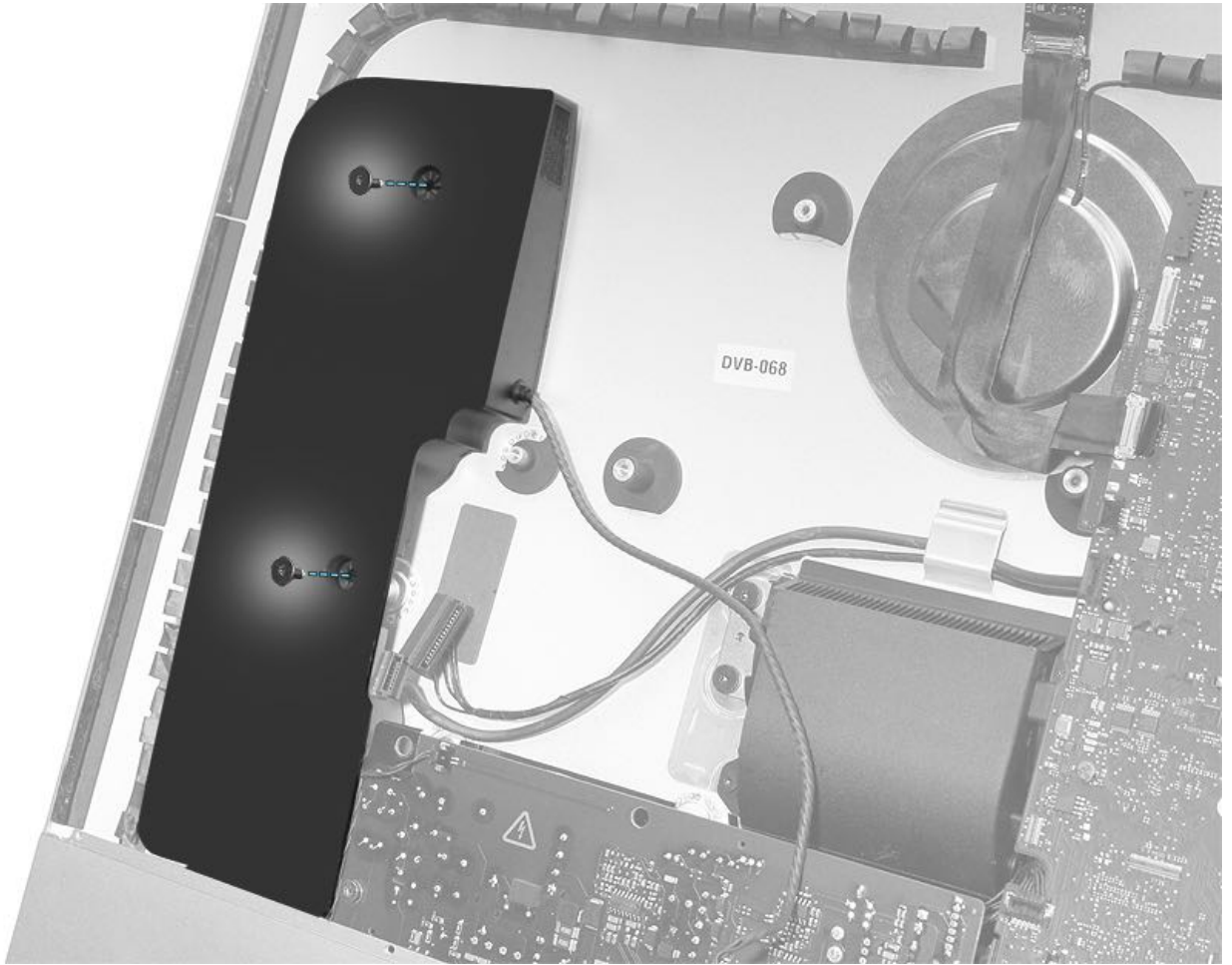
Tools

- ESD wrist strap and mat
- Magnetized Torx 10 screwdriver
- Black stick
- Service wedge, iMac



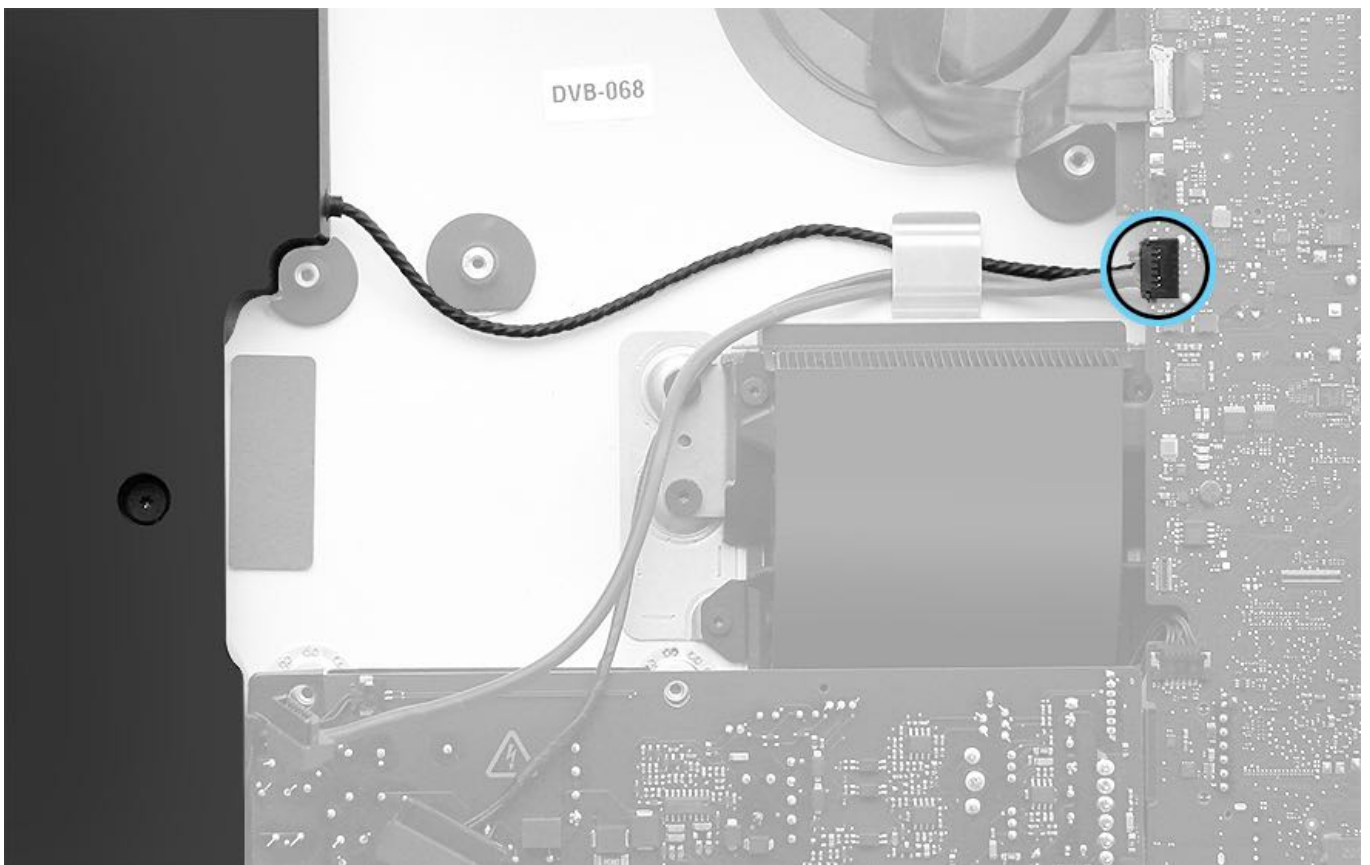
Steps For Removal

1. Remove two (2) 10mm T10 screws (923-0333) from the left speaker. **Note:** The screws tighten into rubber grommets and may remain in the screw holes when the speaker is removed.

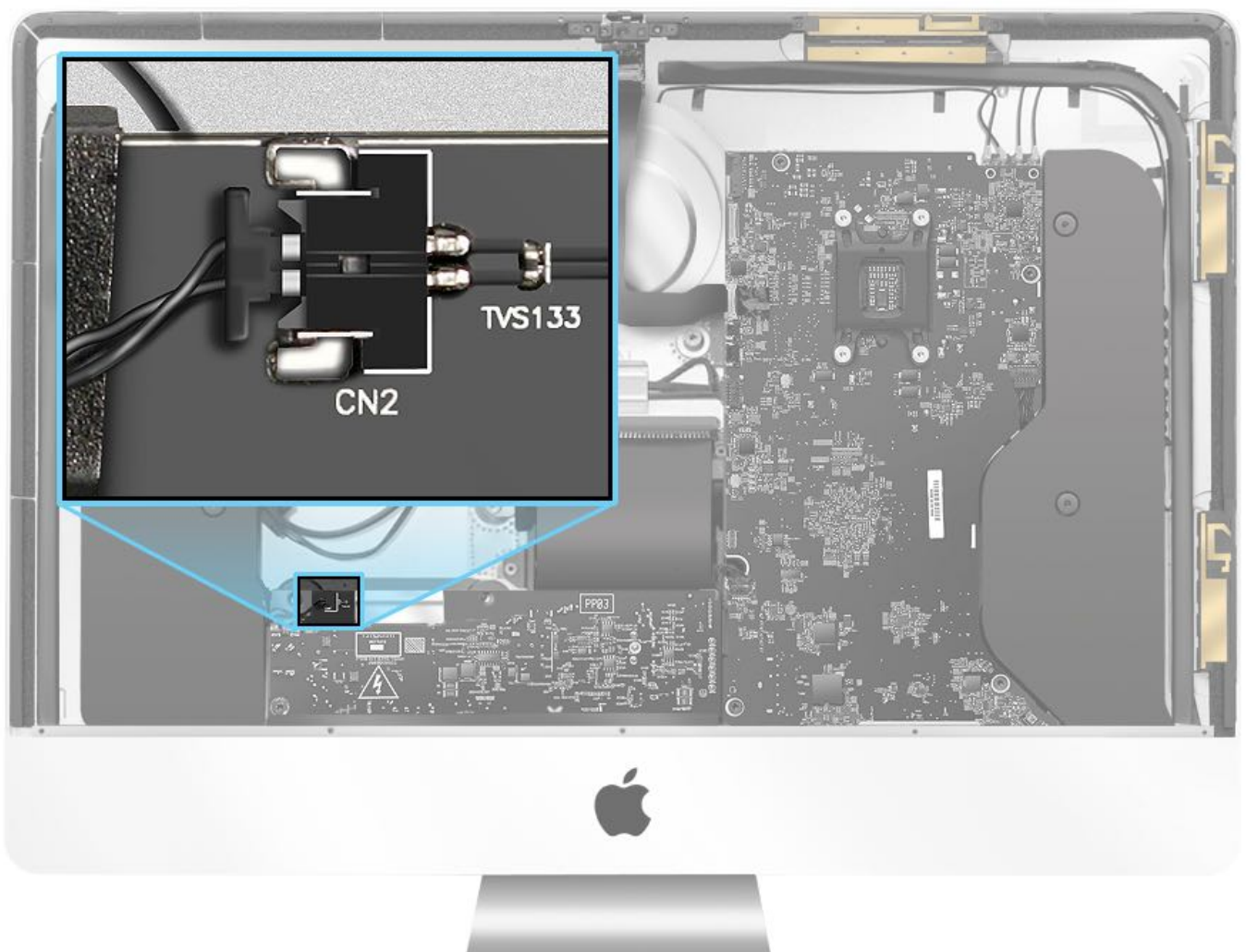


2. Disconnect speaker cable from logic board. Squeeze the sides of the connector while pulling the cable out, to avoid logic board damage.

Caution: Not squeezing the sides of the connector may cause damage to the logic board receptacle.

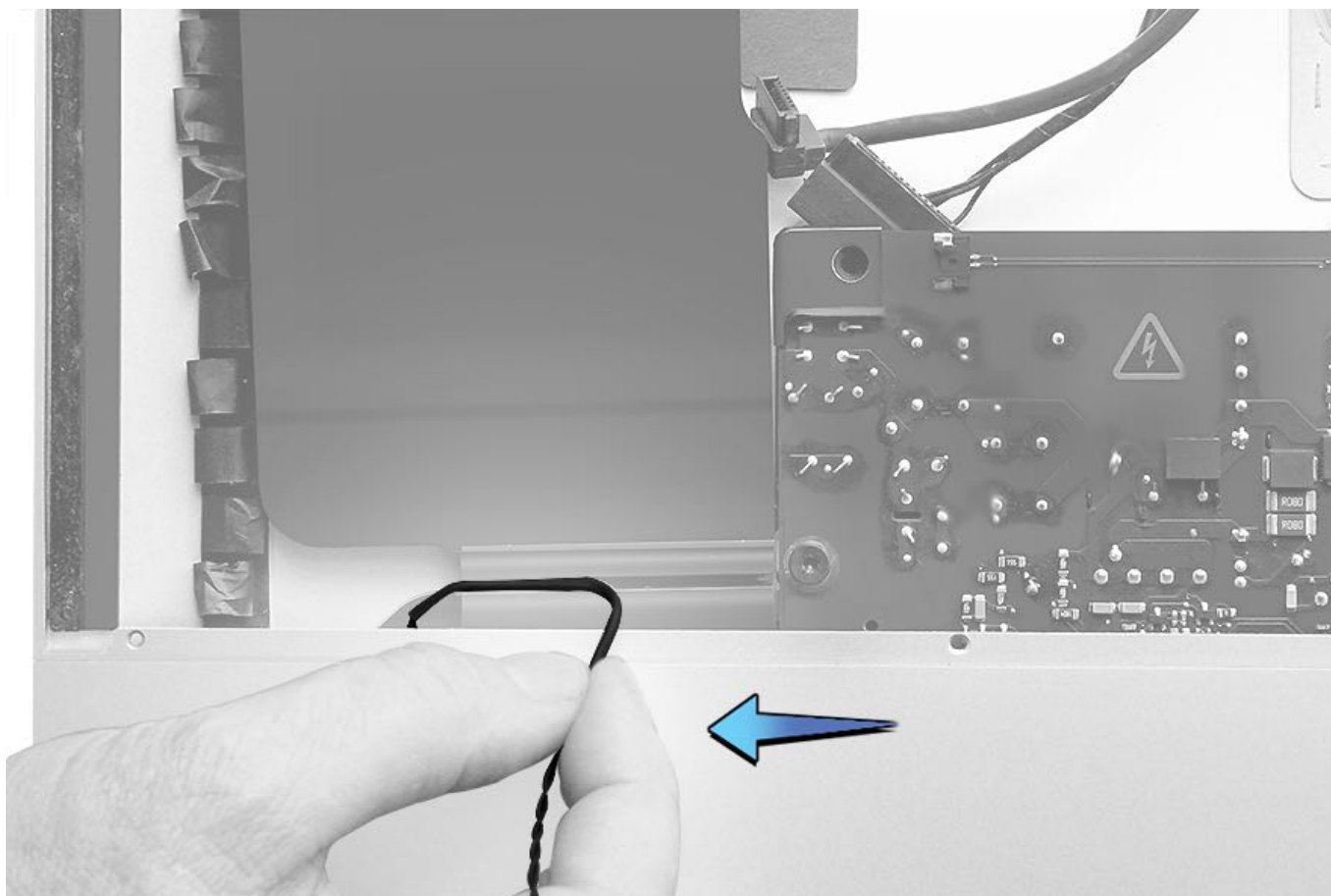


3. Use a black stick to disconnect the power button cable from the power supply. **Caution:** A damaged power button cable requires a rear housing replacement, it is not available separately.

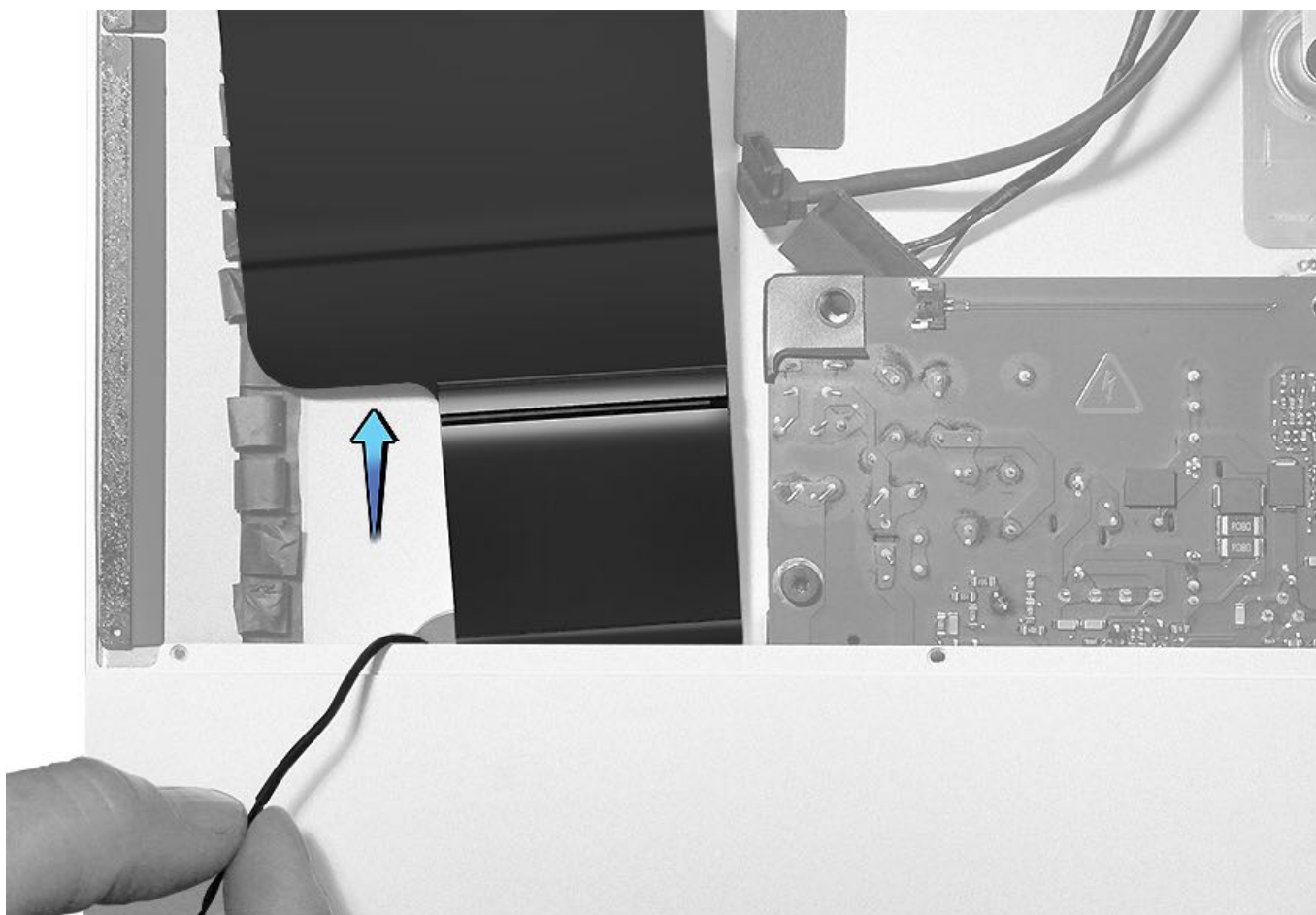


4. Pull the left speaker up enough to see the power button cable routing. Carefully remove the power button cable from the routing groove.

Caution: Failure to remove the power button cable from its routing can result in a damaged cable. A damaged power button cable requires a rear housing replacement.

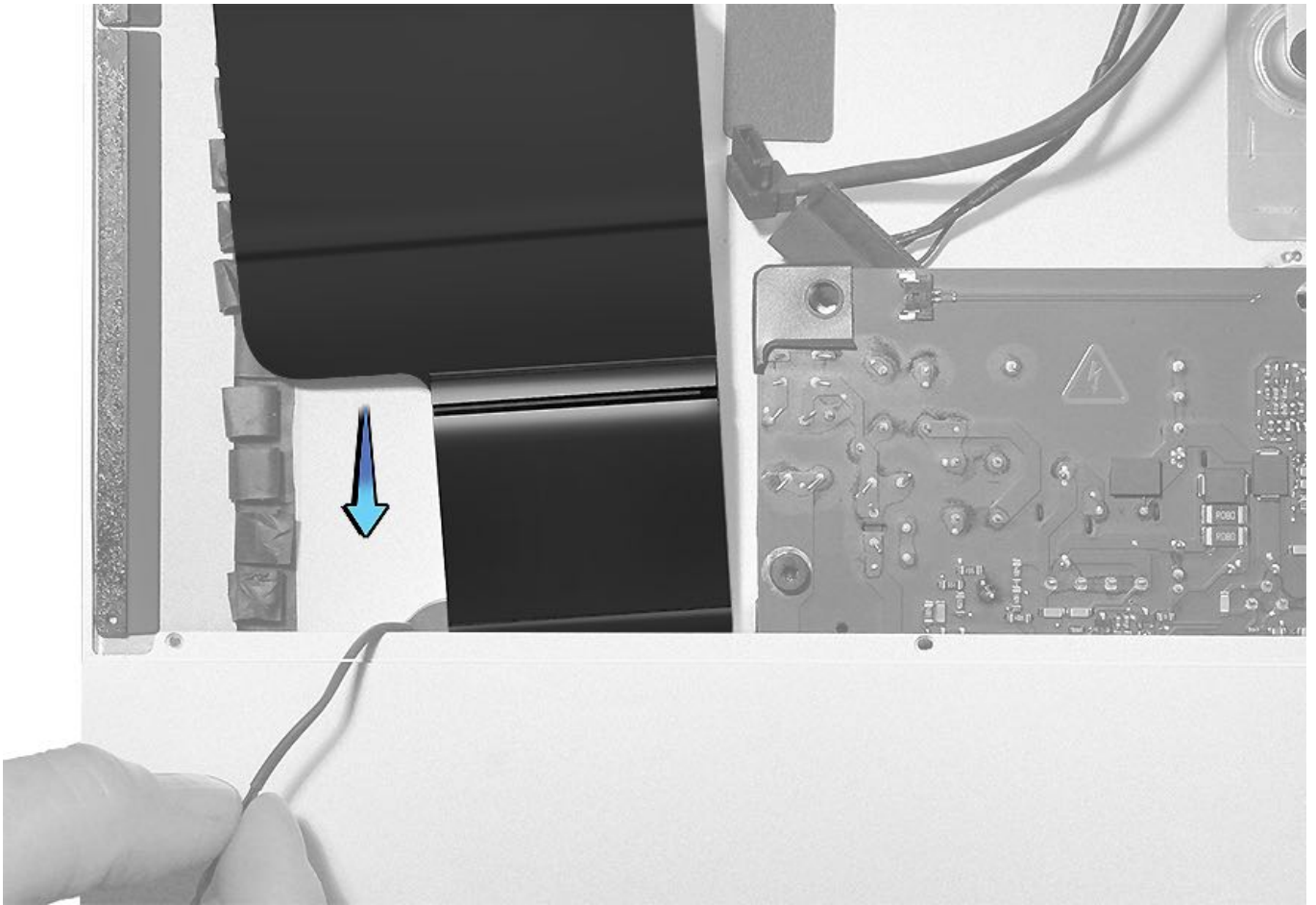


5. Remove left speaker from rear housing.

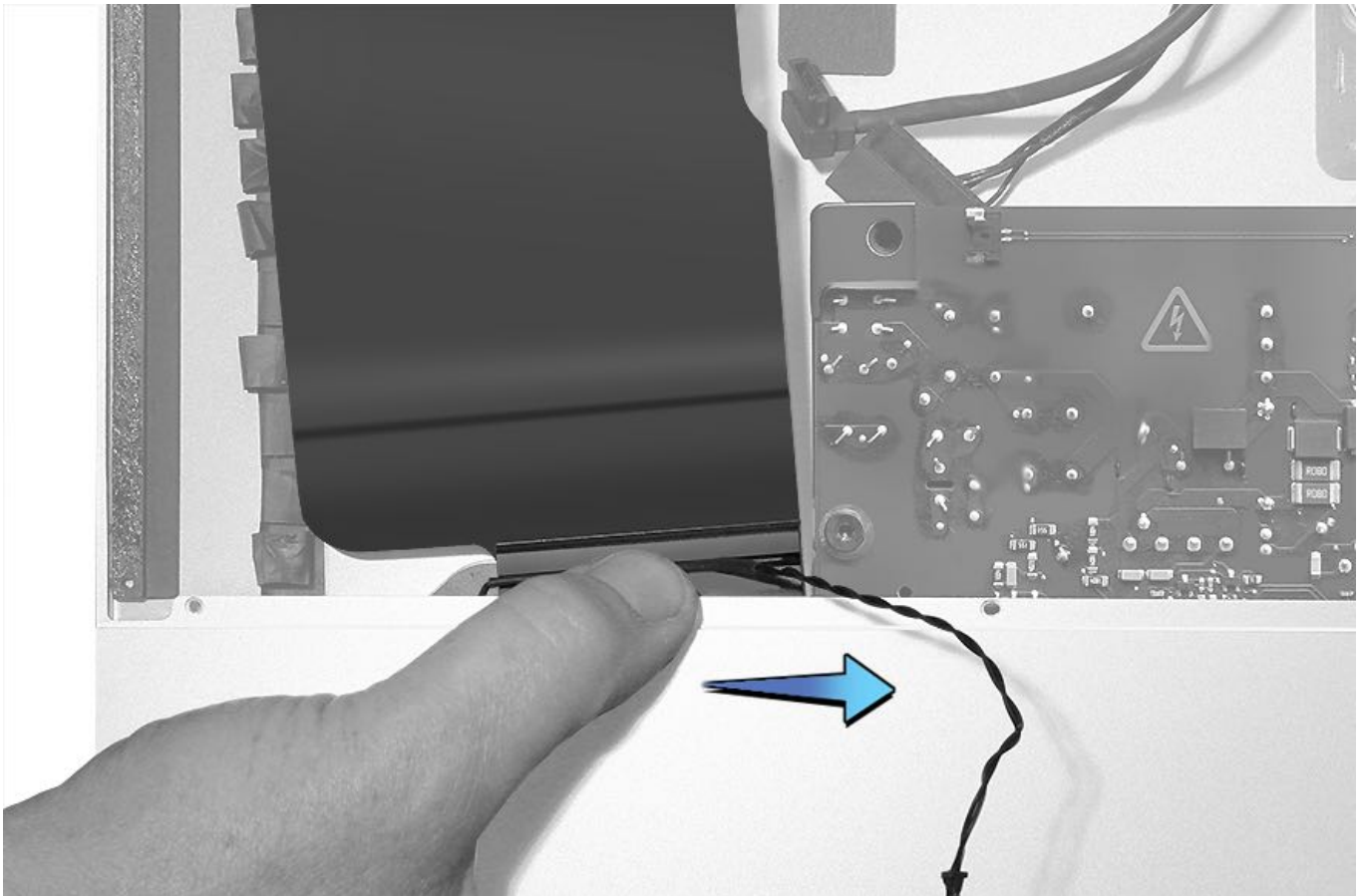


Steps For Reassembly

1. Insert left speaker partially under rear housing chin.

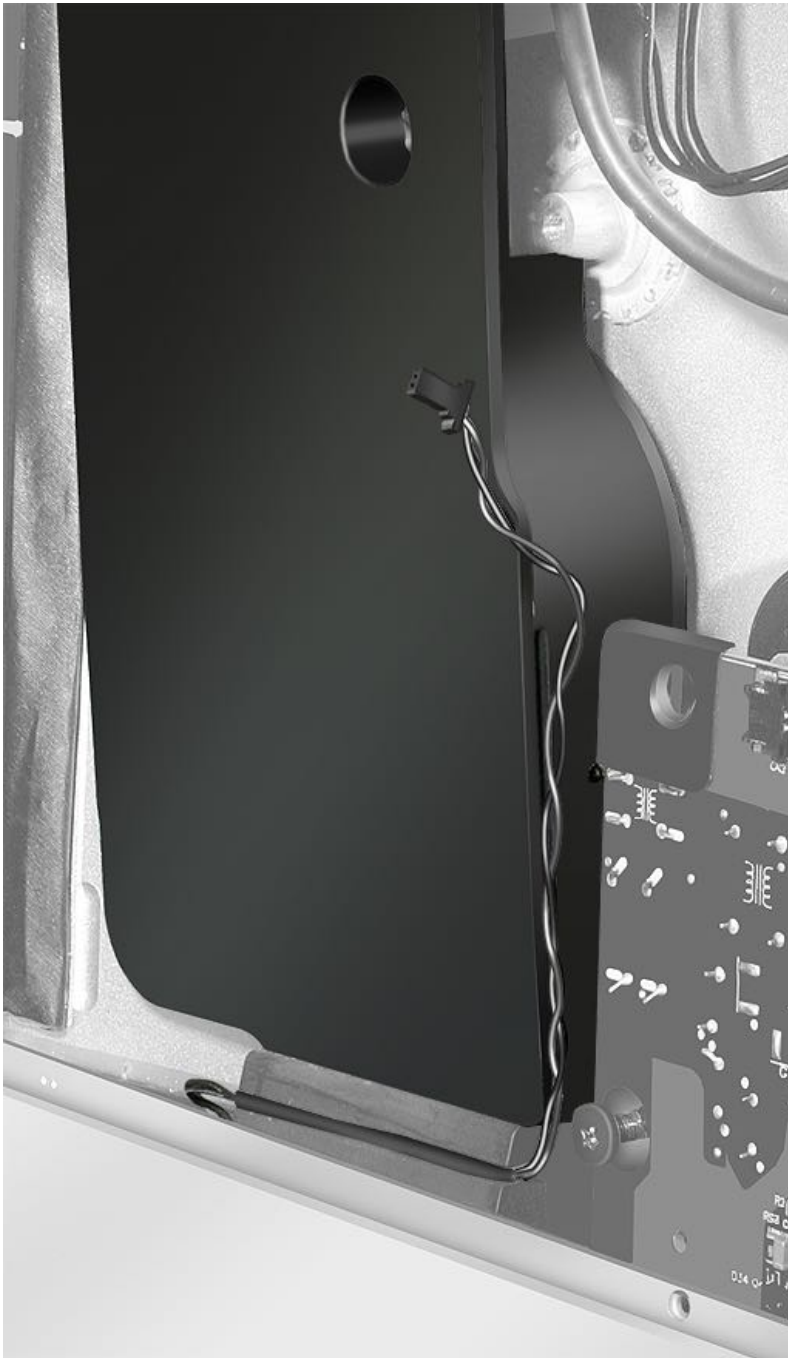


2. Install the power button cable into its routing groove on the left speaker.



3. Continue to route the power button cable along the side of the left speaker.

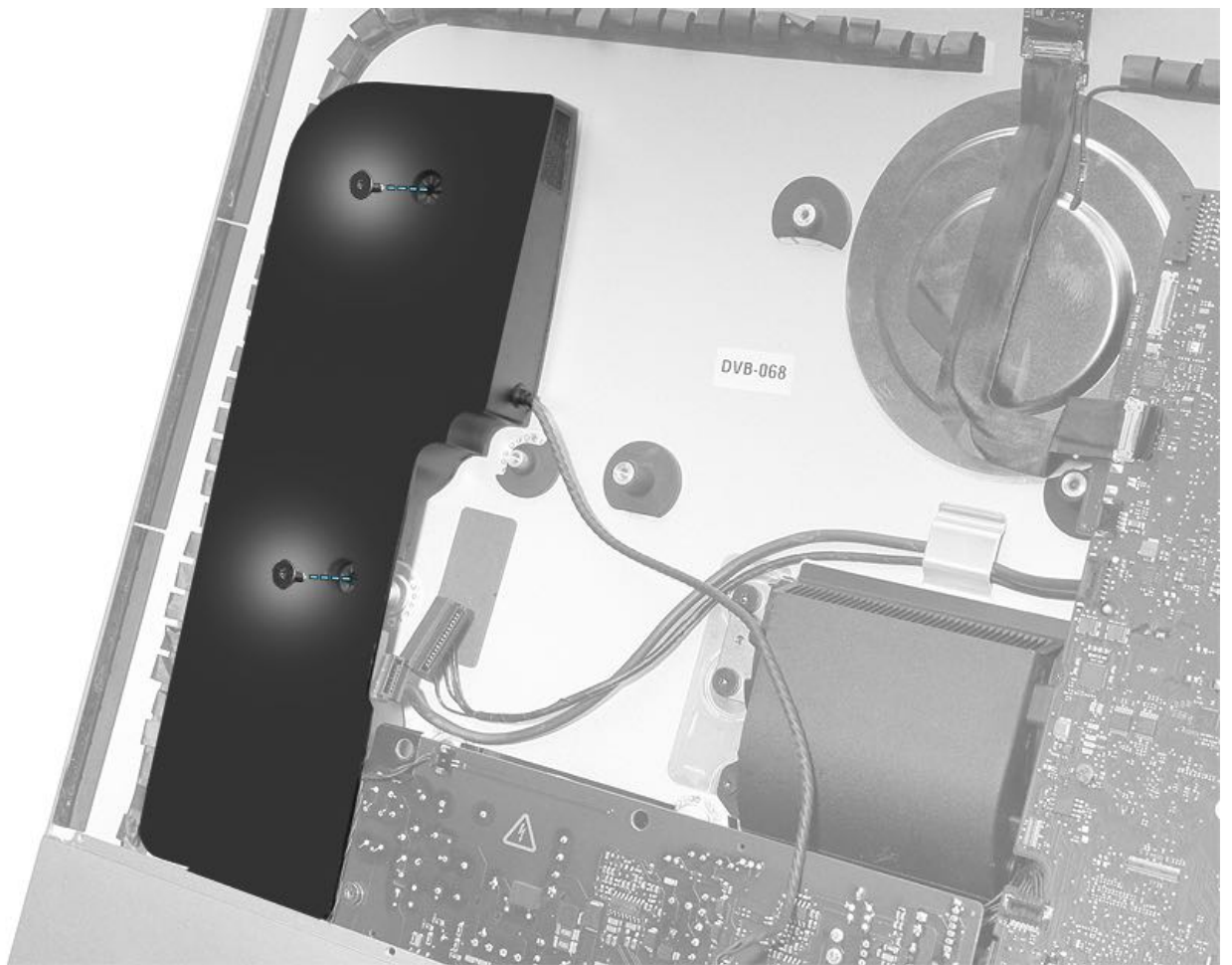
Caution: If the power button cable isn't securely routed in the vertical channel, the cable may come loose and be damaged by the power supply. A damaged power button cable requires a rear housing replacement.



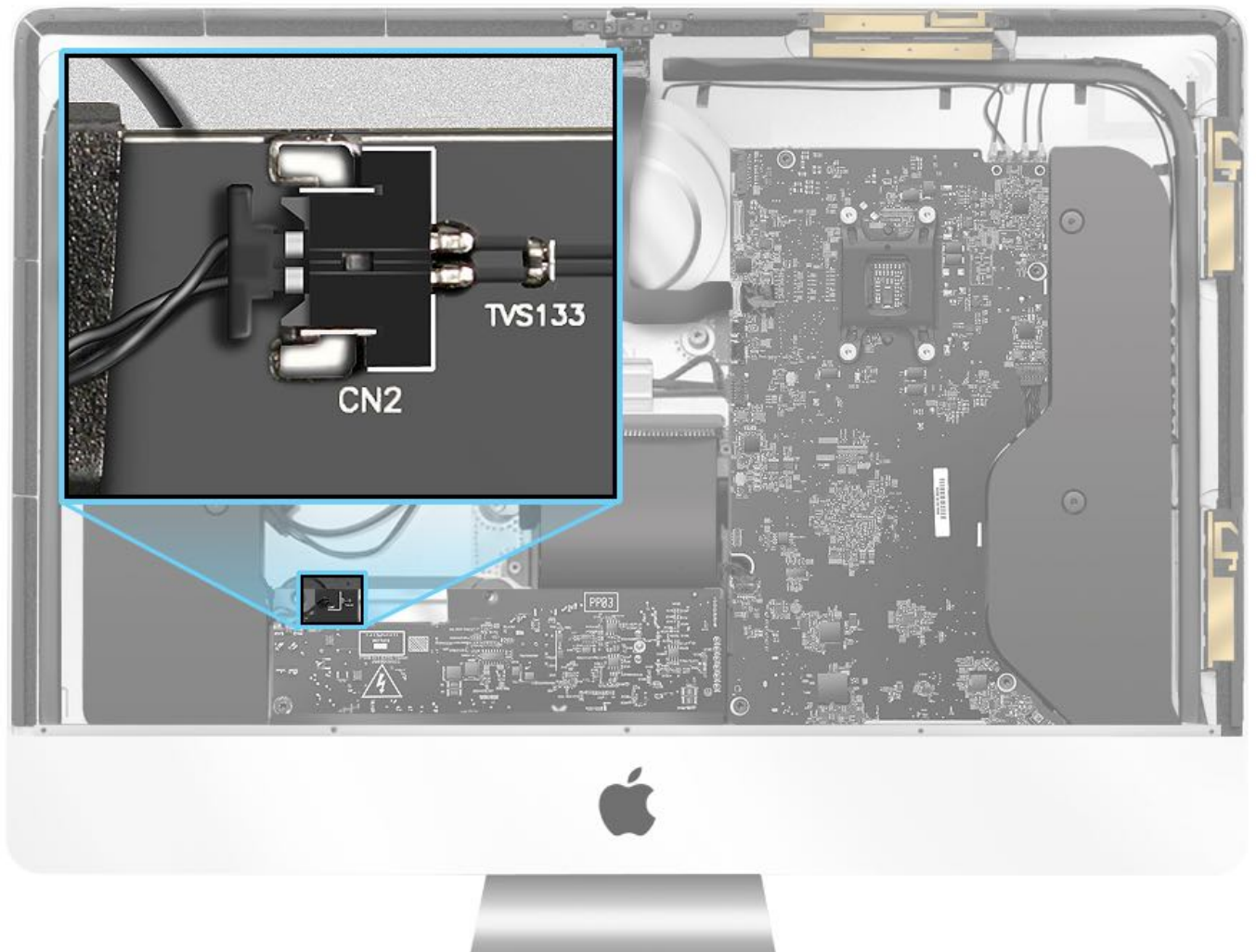
4. Carefully insert the left speaker all the way into the rear housing chin. Watch that the power button cable does not bind or slip out of the routing channel as you position the speaker.

Important: Push firmly to ensure the speaker sits down in the chin as far as possible. If the speaker isn't positioned correctly in the chin, it can cause display interference issues.

5. Install two (2) 10mm T10 screws (922-0333) to the left speaker.



6. Connect power button cable to power supply.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Right Speaker

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

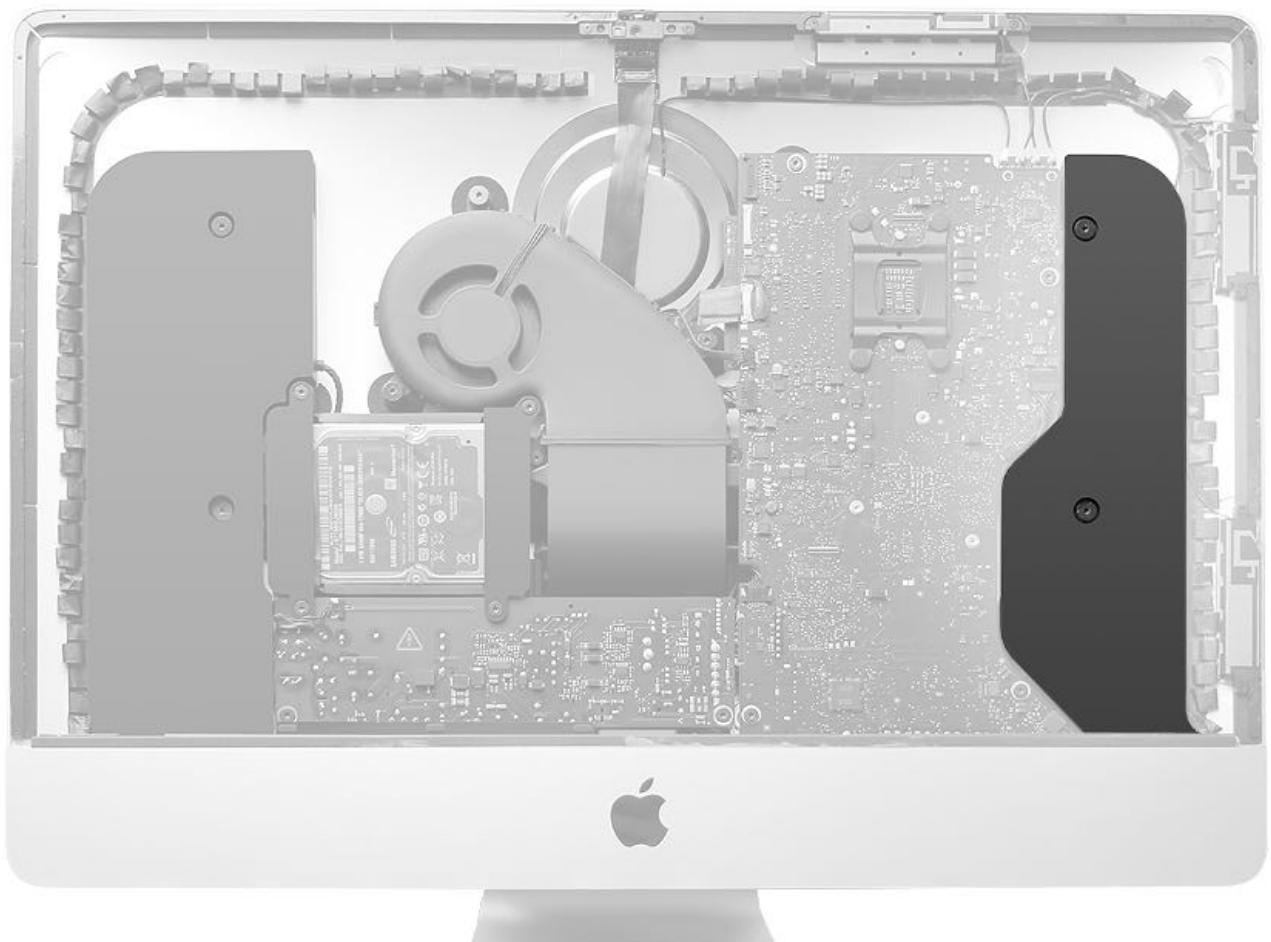
Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Chin Strap](#)

Note: The chin strap must be removed for this repair.

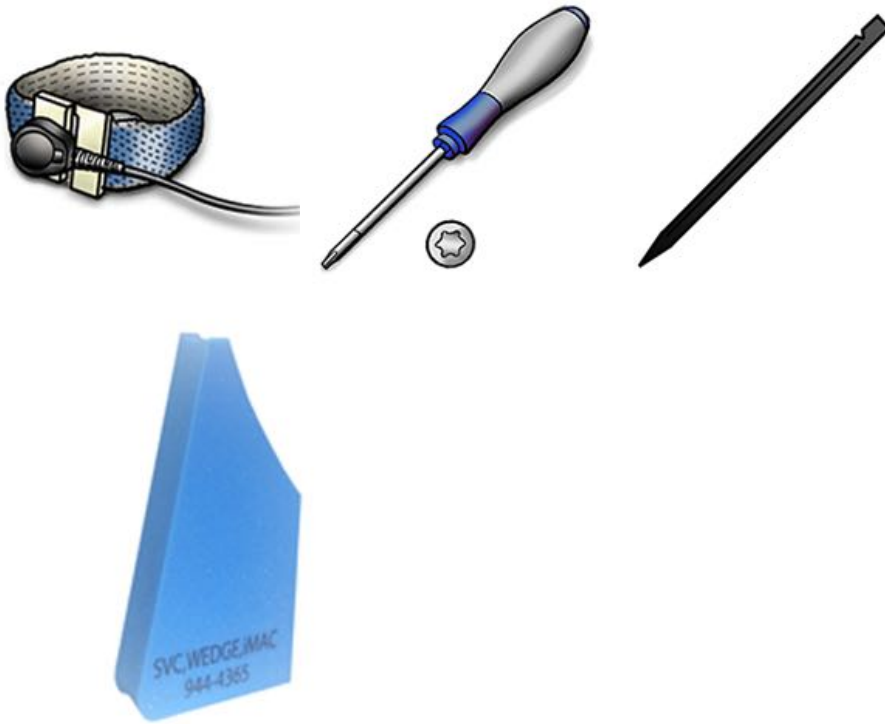
Important: Speakers must be replaced in pairs. If you replace the right speaker you must also replace the left speaker.



Tools

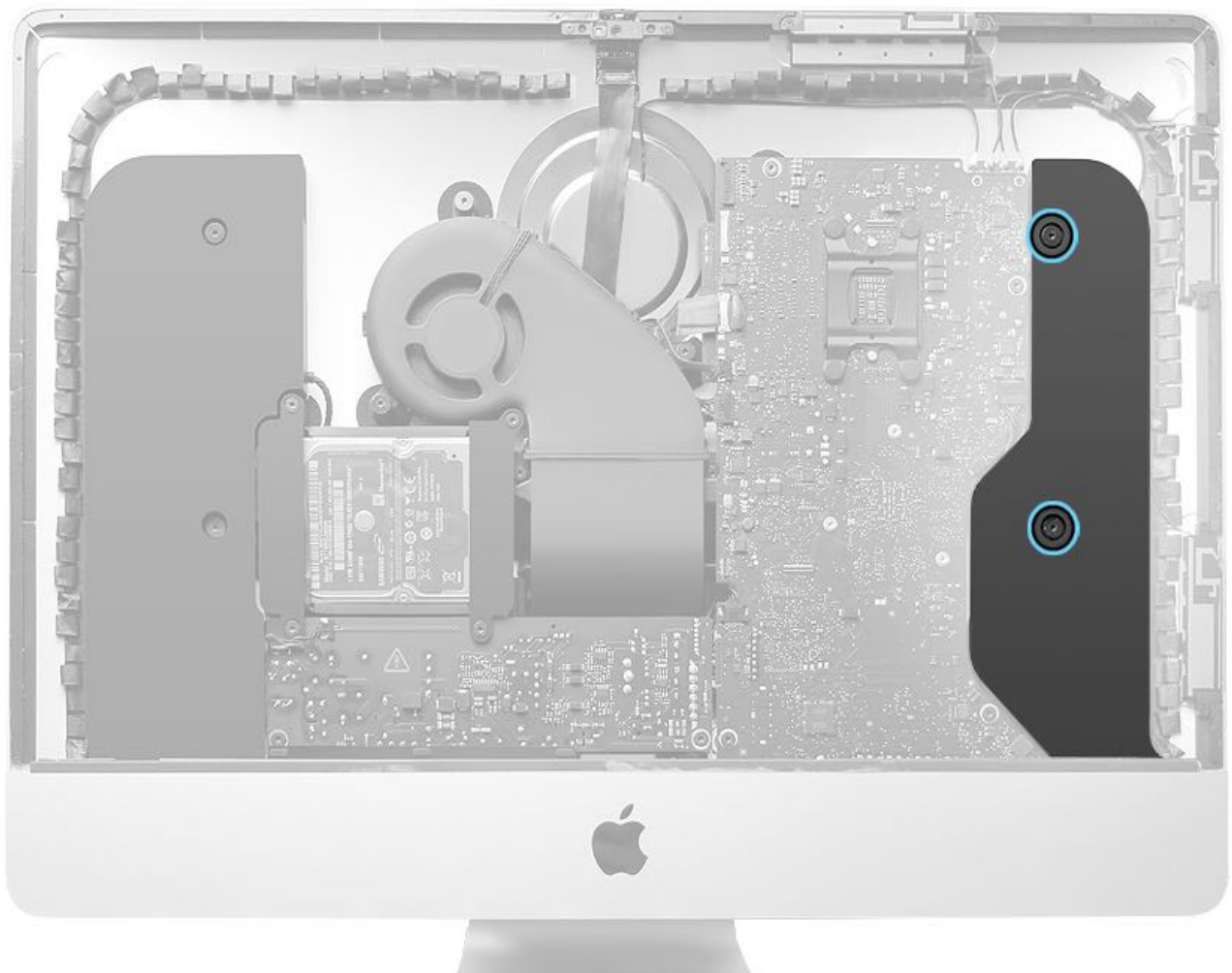
- ESD wrist strap
- Magnetized Torx 8 screwdriver
- Black stick

- Service wedge, iMac



Steps For Removal

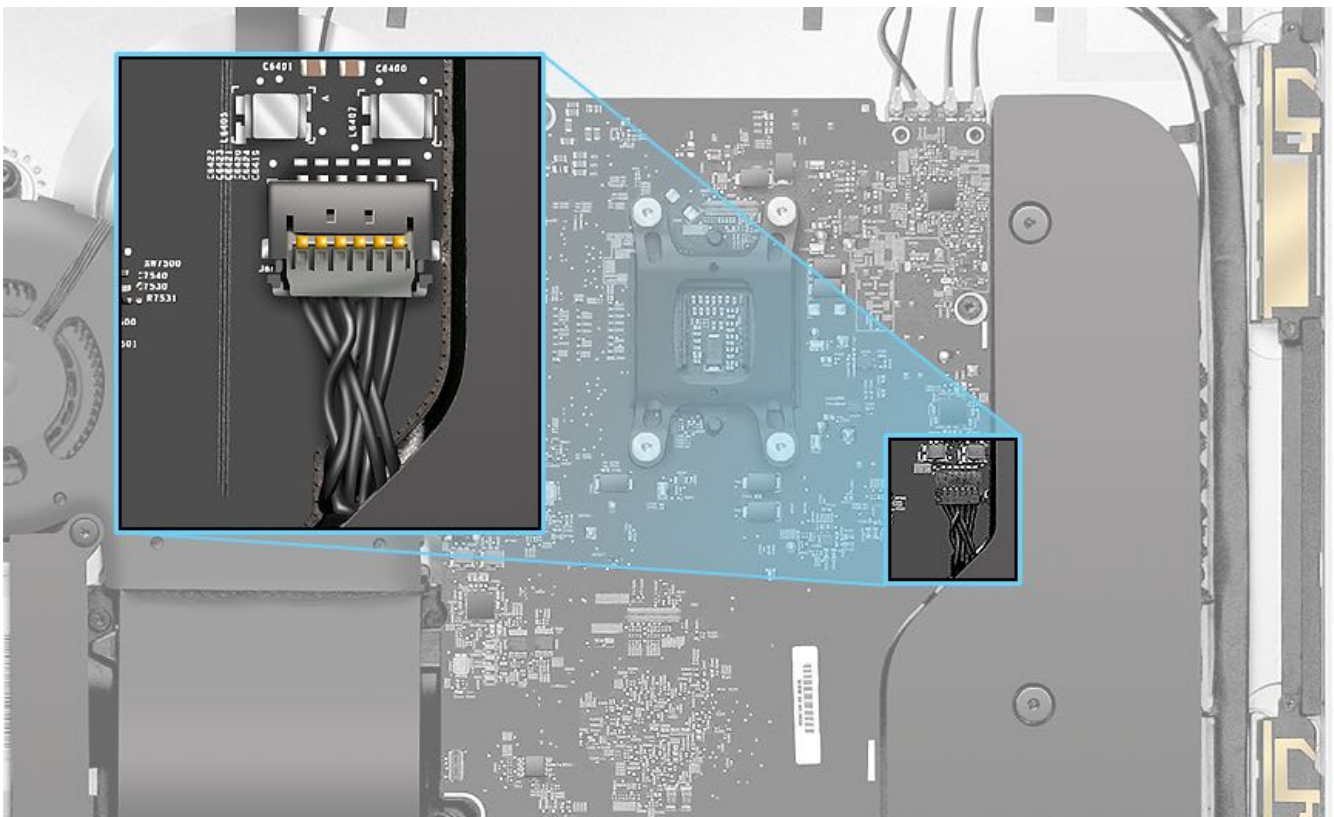
1. Remove two (2) 10mm T10 screws (923-0333) from the right speaker. **Note:** The screws tighten into rubber grommets and may remain in the screw holes when the speaker is removed.



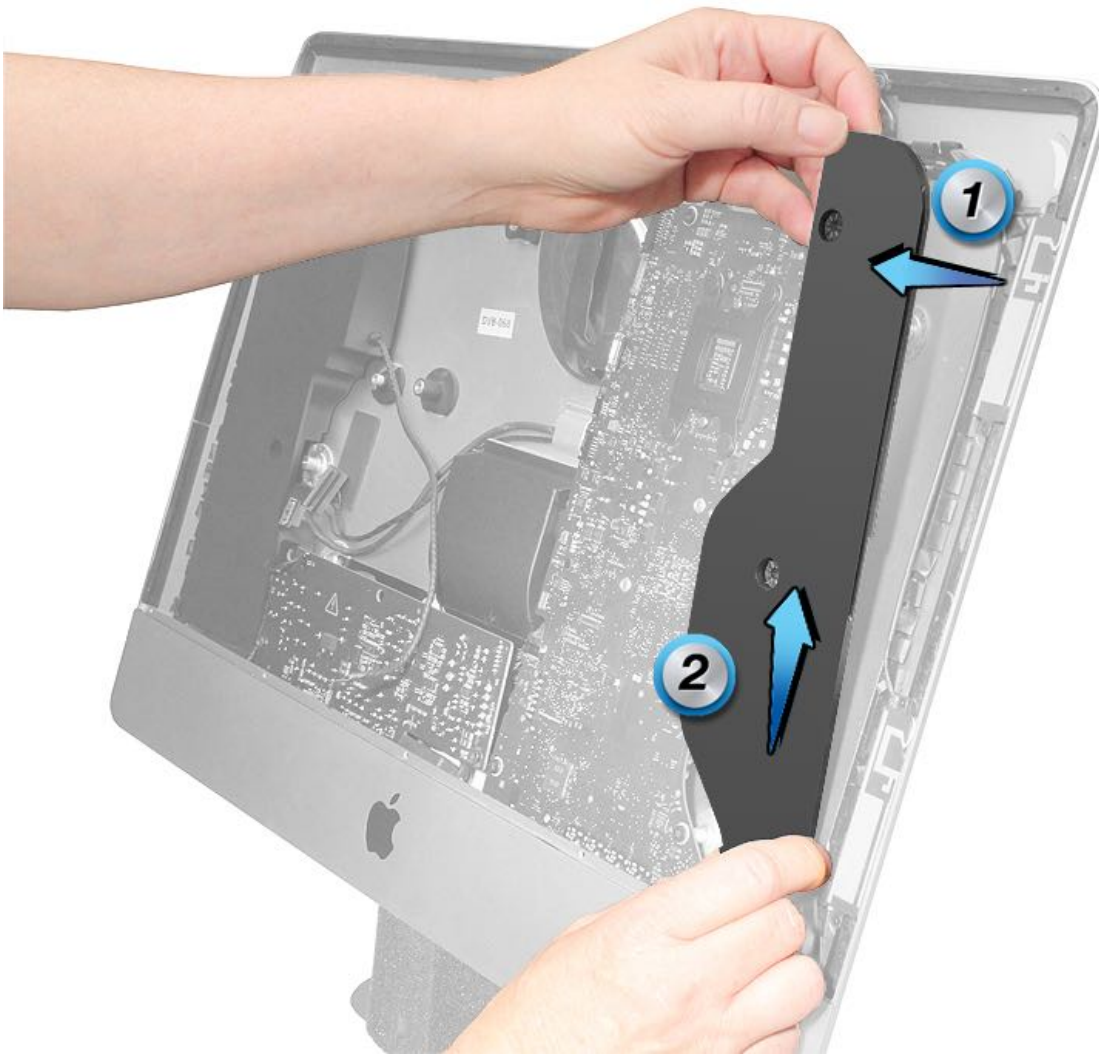
2. Remove the Wi-Fi antenna cable from the routing channel in the right speaker.



3. Disconnect right speaker cable from logic board.



4. Lift the speaker up and over the screw bosses while sliding the speaker up.



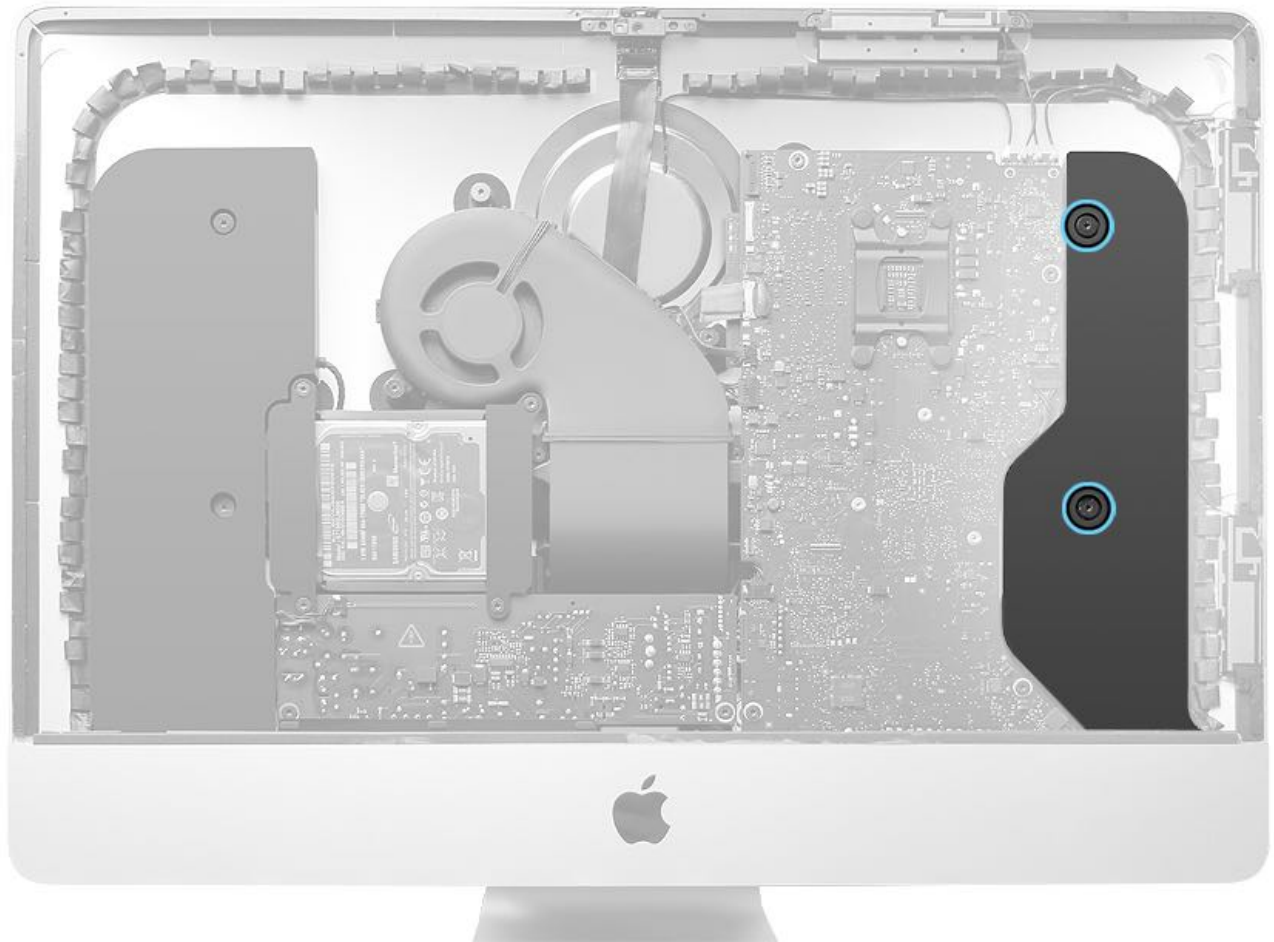
Steps For Reassembly

1. Carefully insert the speaker all the way under the rear housing chin. Be careful of the audio jack inside the chin.

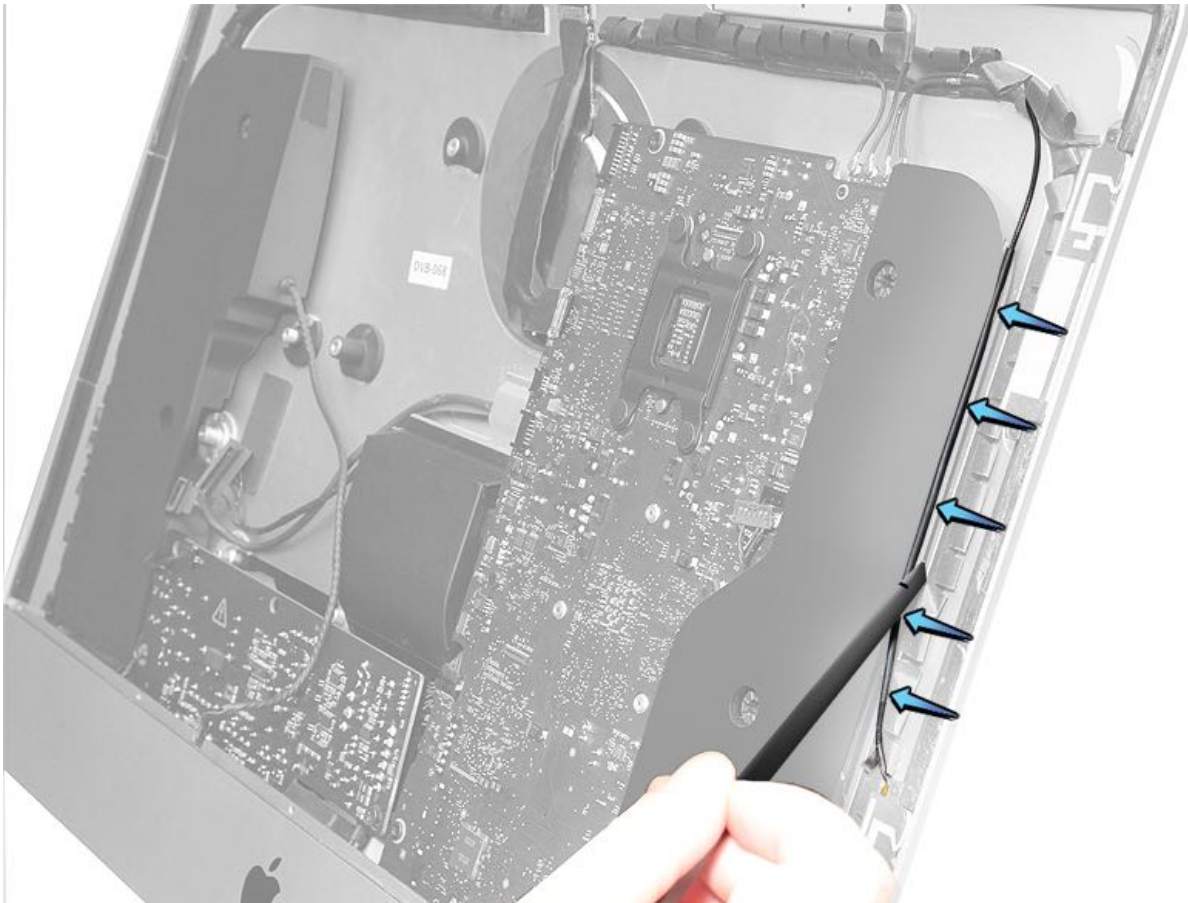
Important: Push firmly to ensure the speaker sits down in the chin as far as possible. If the speaker isn't positioned correctly in the chin, it can cause display interference issues.



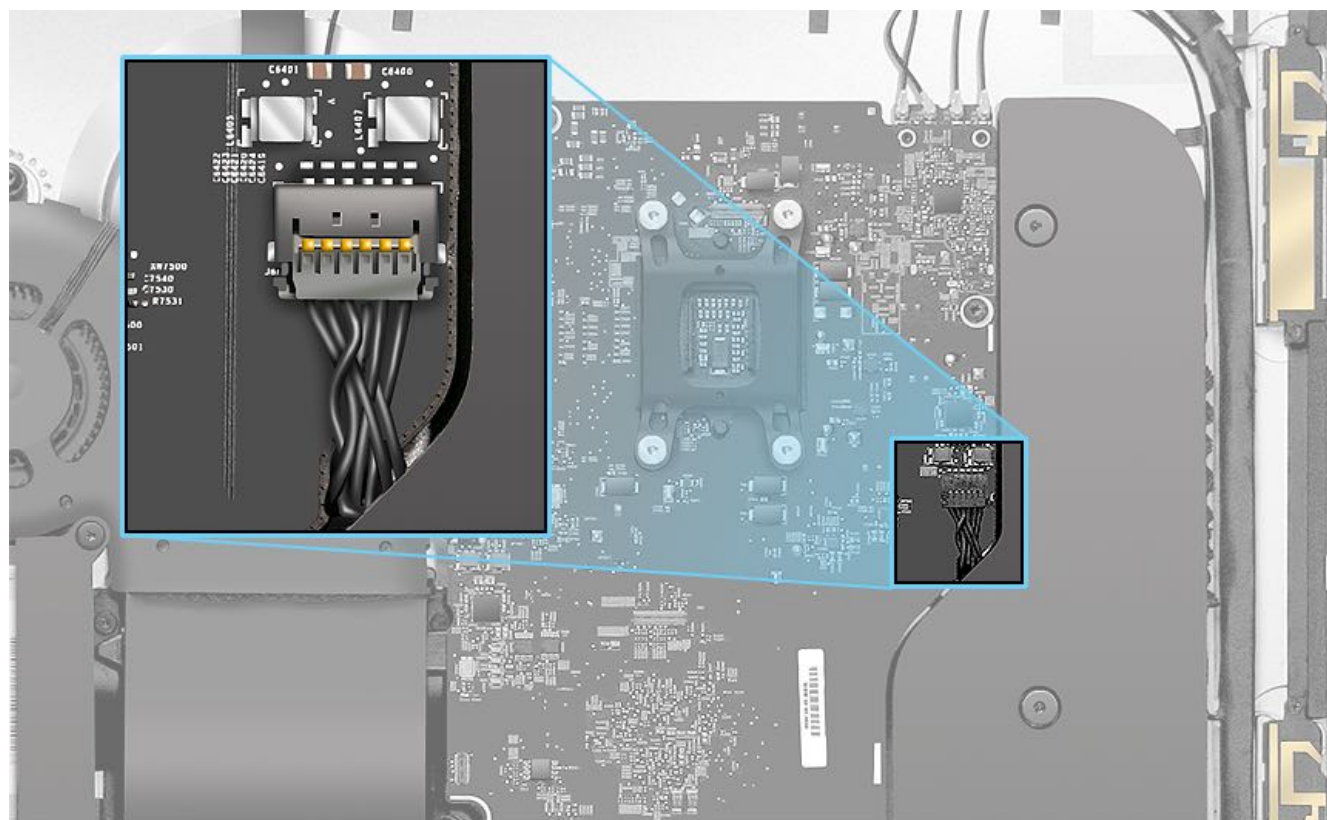
2. Install two (2) 10mm T10 screws (922-0333) to the right speaker.



3. Route the Wi-Fi antenna cable into the routing groove on right speaker.



4. Route speaker cable into the notch on logic board. Connect speaker cable to logic board.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Logic Board

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

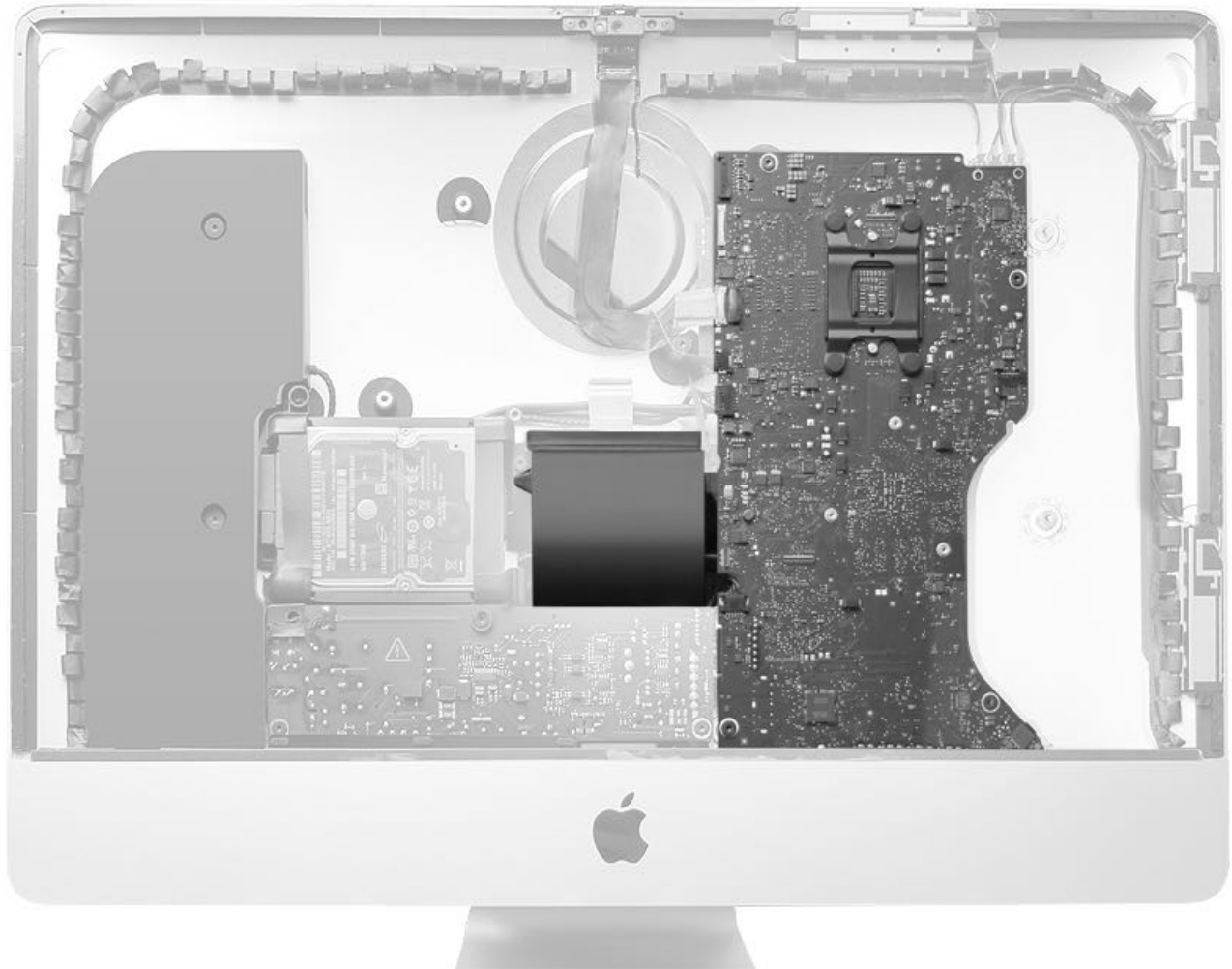
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)

Note: The chin strap must be removed for this repair.



Tools

- ESD-wrist strap and mat
- Torx T4 screwdriver (for wireless card removal)
- Torx T8 screwdriver
- Torx T10 screwdriver
- black stick
- Service wedge, iMac
- Mini DisplayPort or Thunderbolt and USB cables for reassembly (not pictured)

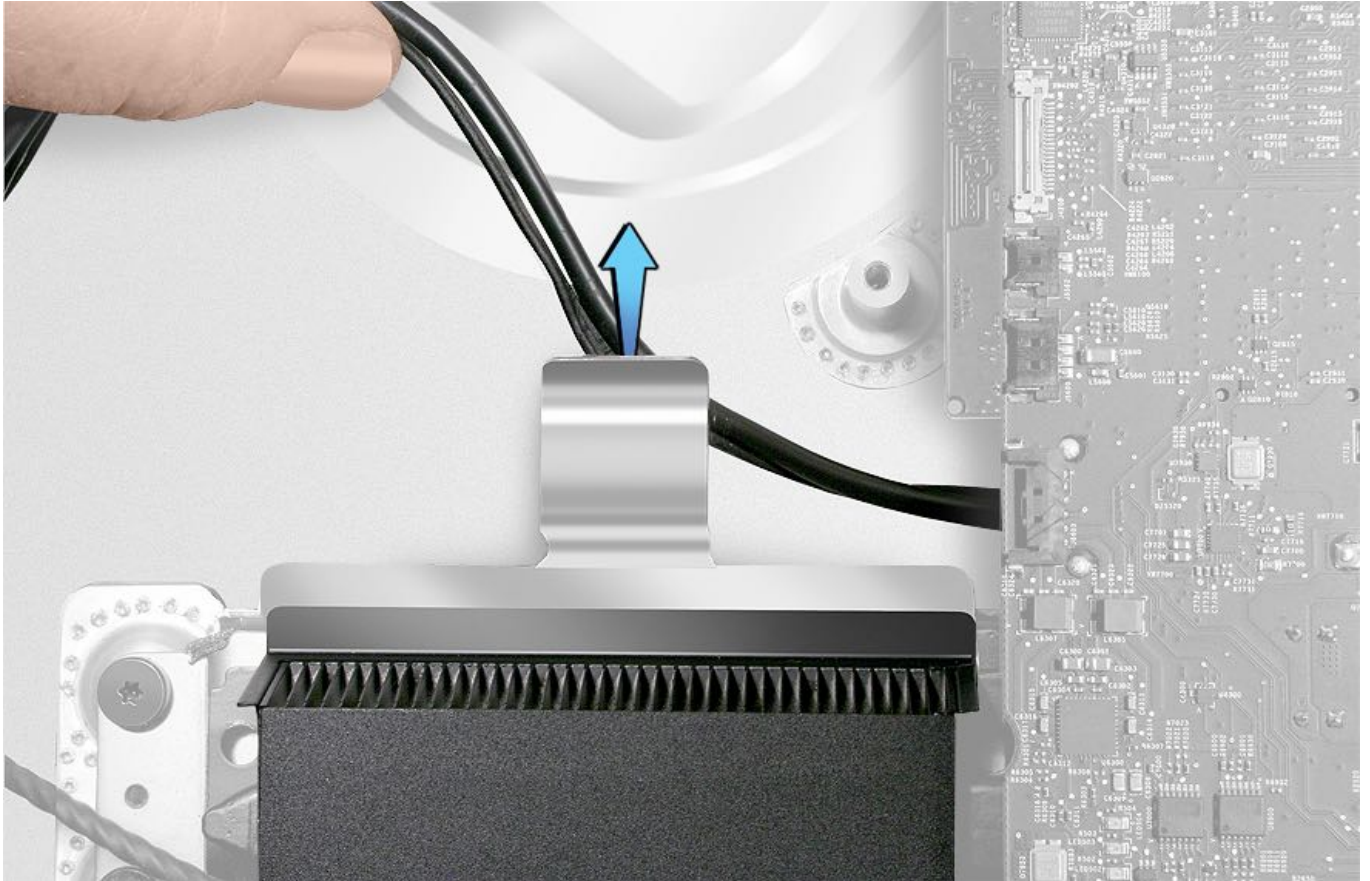
If removing or replacing the wireless card, you will also need the following tools:

- Nitrile gloves (use when cleaning twinpak thermal material)
- Black stick
- Thermal pad kit, 076-1445 (replaces the twinpak thermal material)
- Isopropyl wipes (IPA)
- Thermal paste
- Kapton tape (use when applying twinpak thermal material)
- Safety goggles (use when cleaning twinpak thermal material) (Not pictured)

Note: On July 17, 2013, a thermal pad kit (076-1445) replaced the original twinpak of thermal material (076-1425) necessary for installing wireless cards in iMac (Late 2012, Early 2013) models. The thermal pad kit is included with wireless card and logic board replacement parts on the iMac (Late 2012 and Early 2013) models. On the iMac (Late 2013) models, the thermal pad is **only** included with the wireless card. The kit also available separately (076-1445). If your twinpak of thermal material (076-1425) has not expired, you may use it; however, it's much easier, cleaner, and quicker to install a thermal pad.

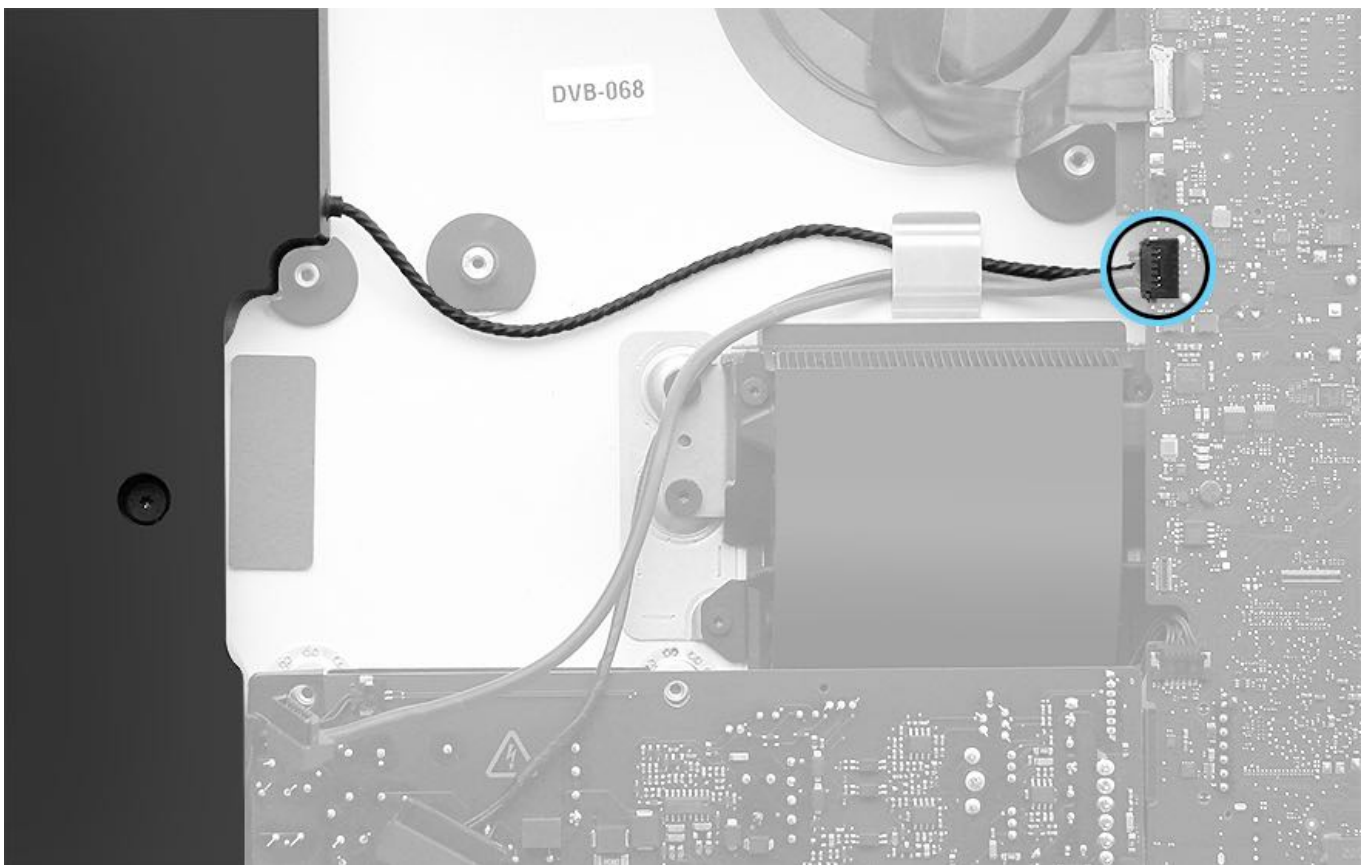
Whenever you remove or replace the wireless card in an iMac (Late 2012, Early 2013) model check for a dollop of original thermal material. If present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.

iMac (21.5-inch, Late 2012, Early 2013)

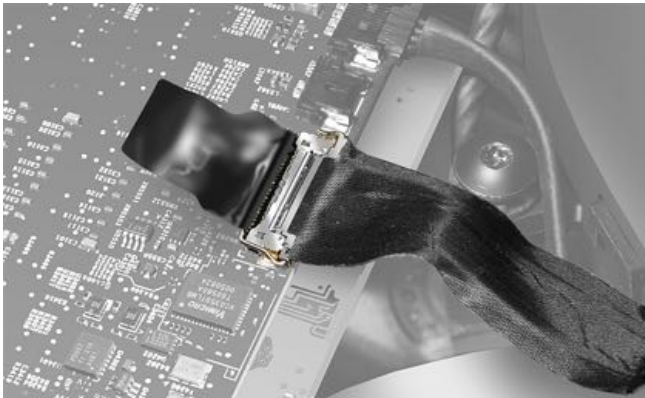


iMac (21.5-inch, Late 2013)

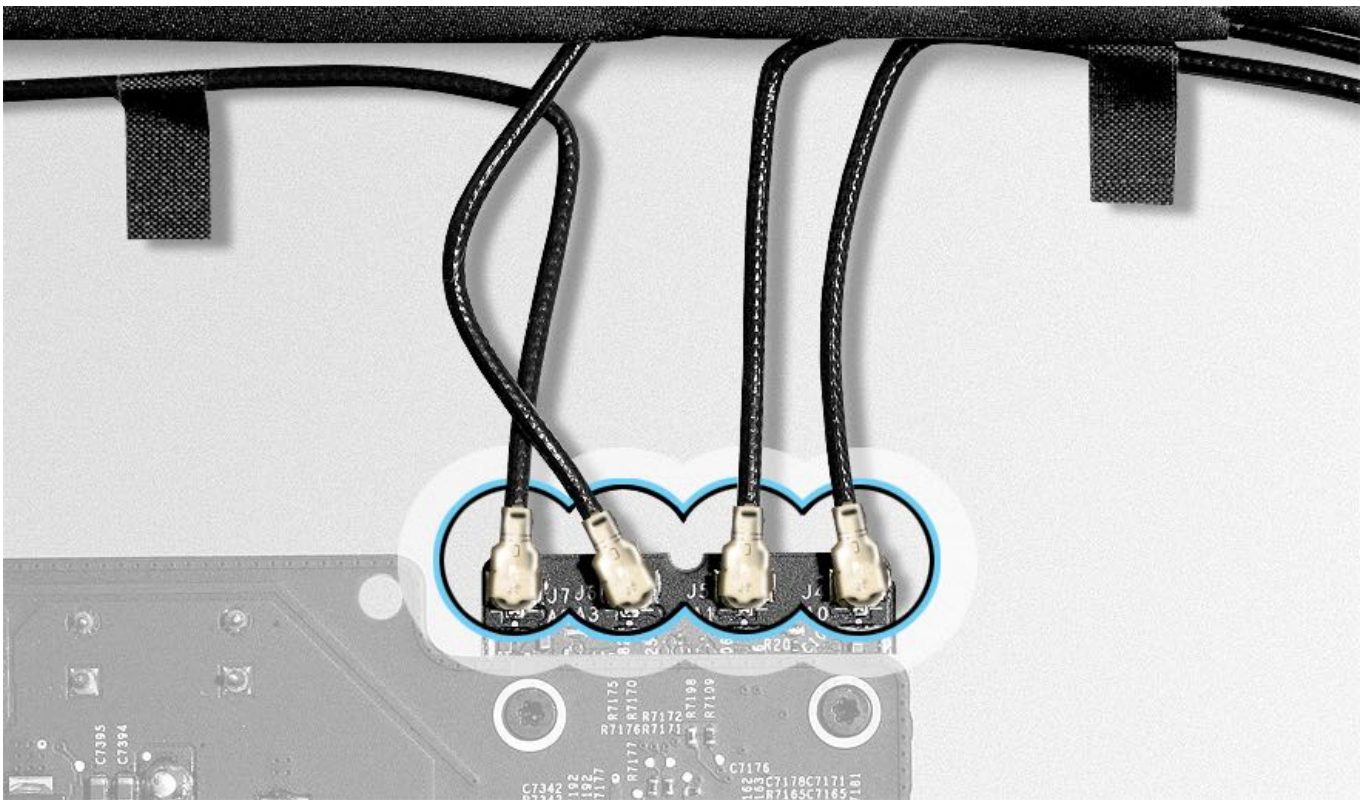
3. Disconnect left speaker cable from logic board. Squeeze the sides of the connector while pulling the cable out, to avoid logic board damage. **Caution:** Not squeezing the sides of the connector may cause damage to the logic board receptacle.



4. Disconnect camera/microphone cable from logic board. Flip the locking-lever bar toward the cable and pull cable straight out of connector.



5. Disconnect four (4) antenna cables from the wireless card.



6. Remove four (4) 7.2mm T10 screws (923-0331) from the logic board.

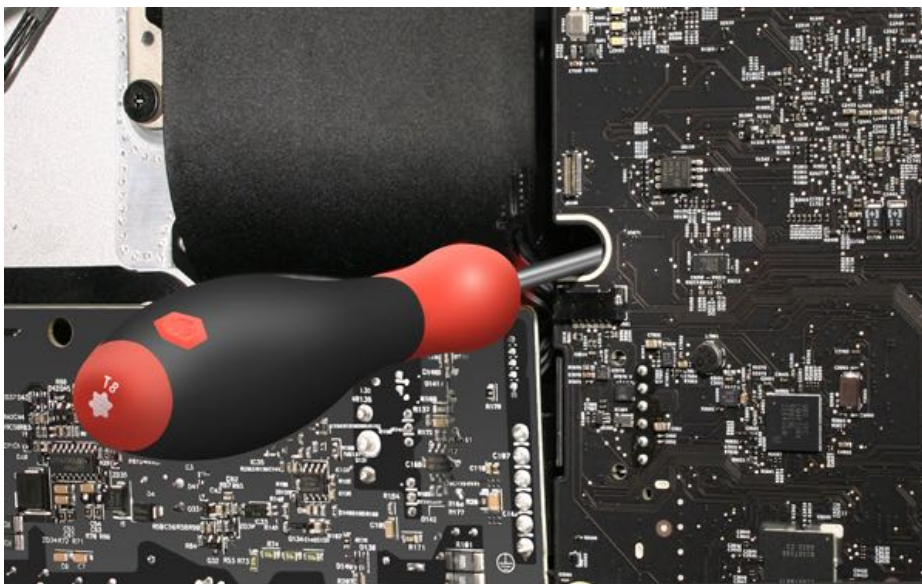
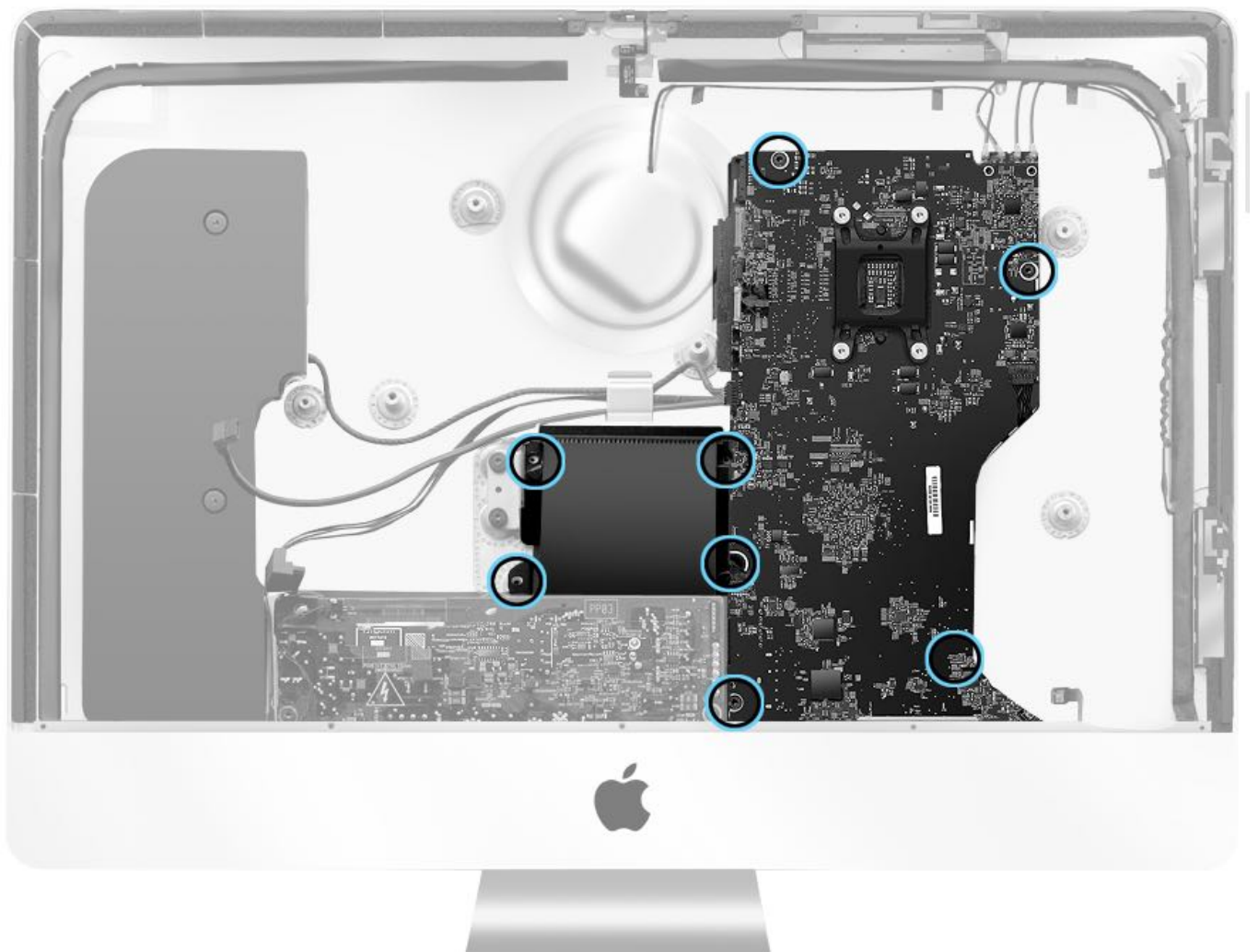


7. Remove four (4) T8 screws from the heat sink:

- (2) longer screws, 923-0327, on upper finstack
- (2) shorter screws, 923-0336, on lower finstack

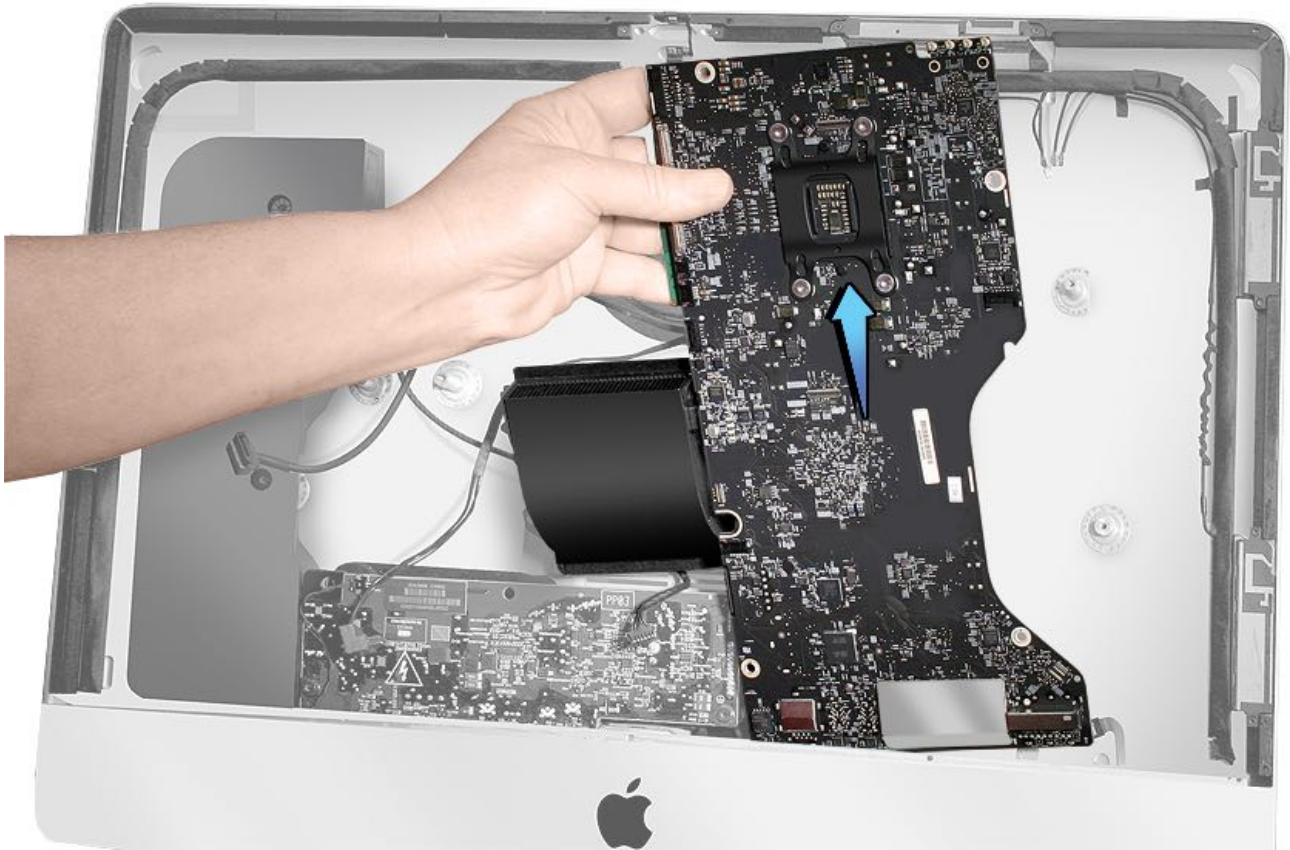
Tip: Lay the computer down when removing the heat sink screws so they don't fall into the chin well.



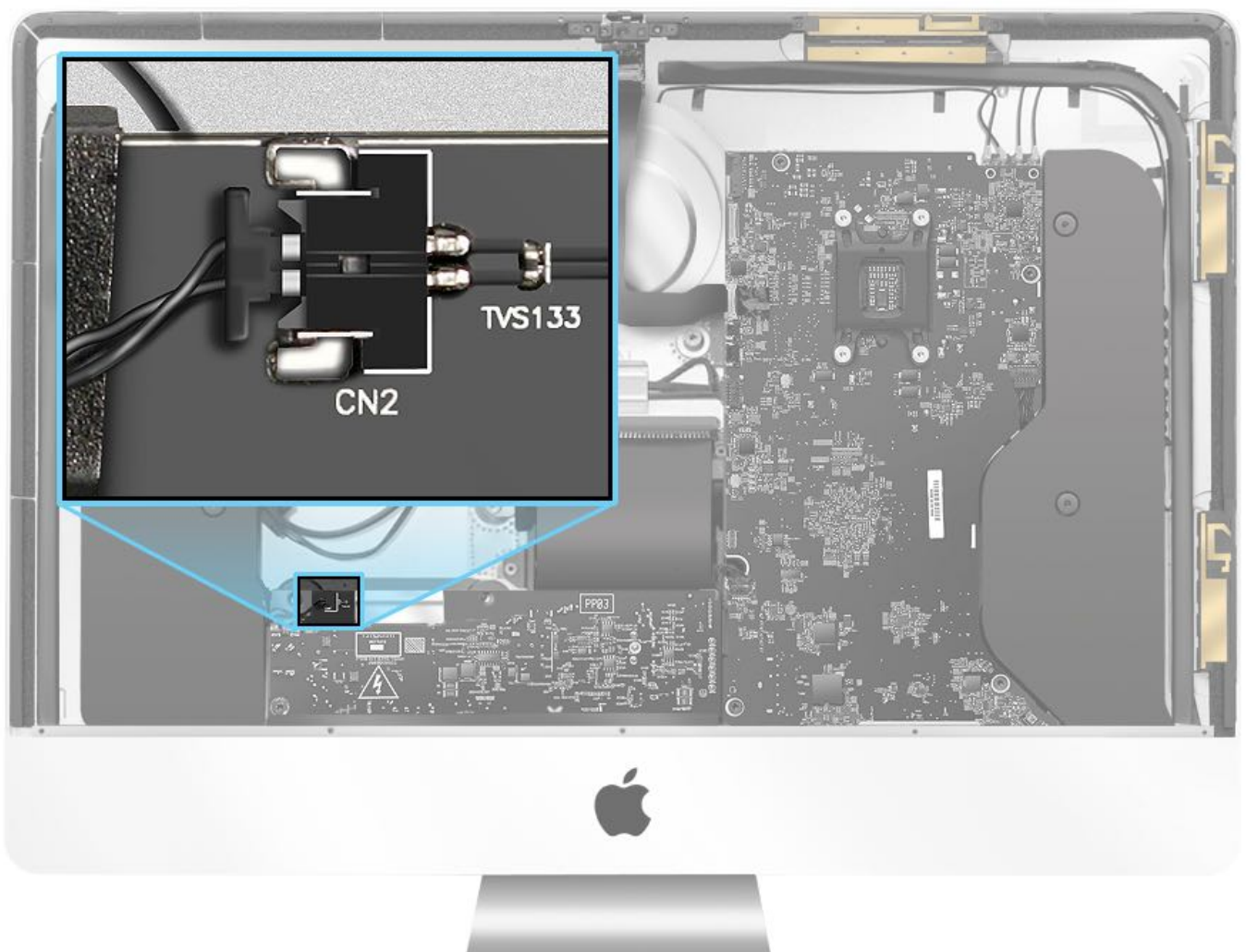


8. Carefully pull logic board up and partly out of the chin. The logic board is still attached to the power supply.

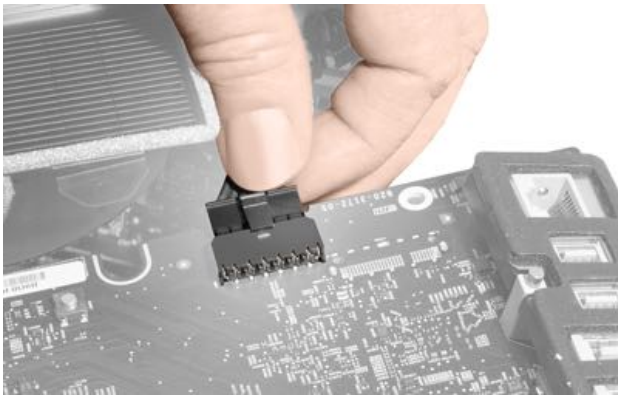
Caution: Be careful to not scratch the chin.



9. Disconnect power button cable from power supply. **Note:** If the power button cable breaks, the rear housing will need to be replaced. The power button cable is not available separately.

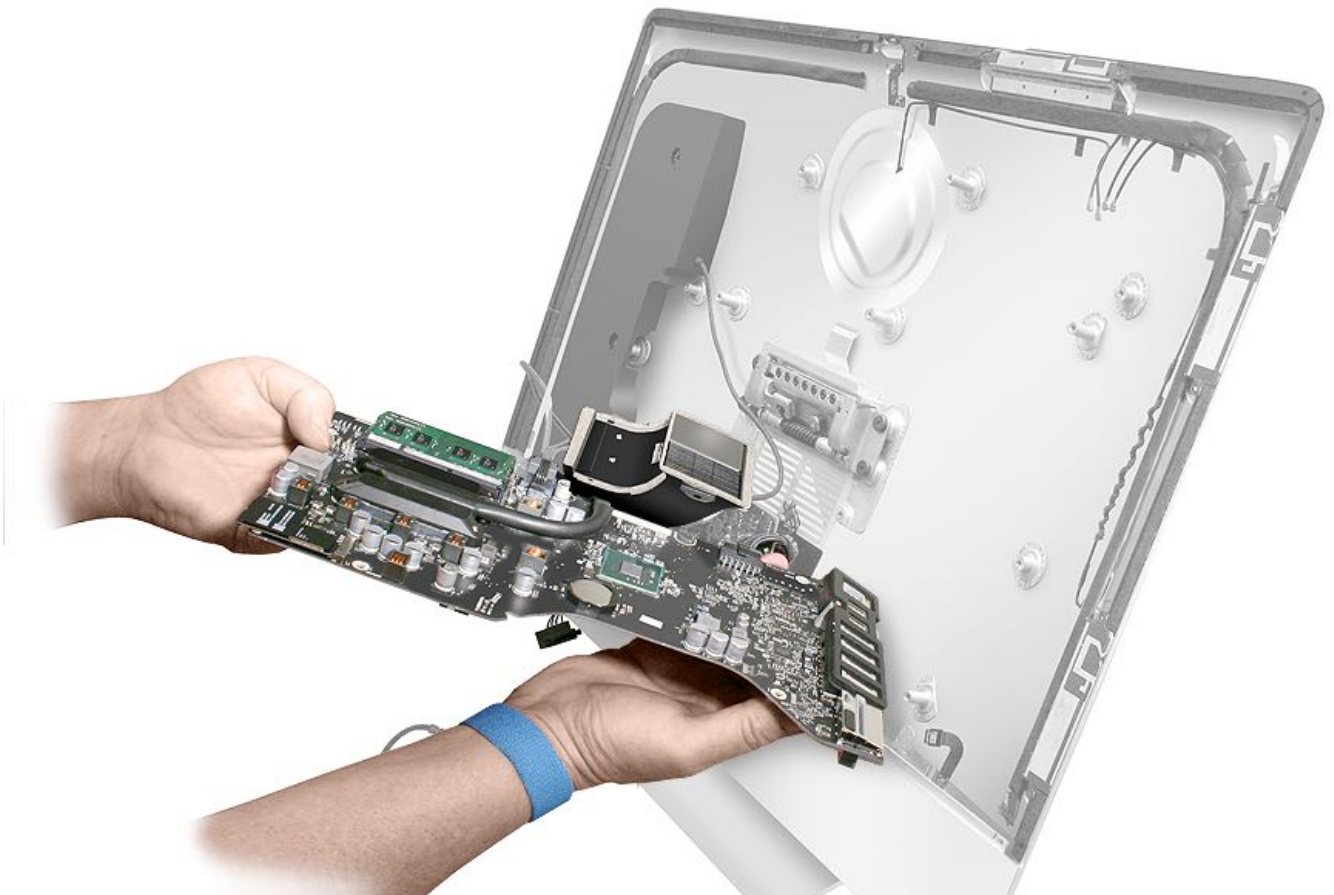


10. Disconnect two (2) power supply cables, one on the front of logic board and the other on the rear of logic board.



11. Carefully remove logic board from rear housing.

12. Verify that tamper indicator labels on the heat sink are intact. If labels have been removed or tampered with, the logic board is not eligible for exchange.



Steps For Reassembly

1. **Replacement Note:** If replacing the logic board on a 2.7GHz iMac, be sure to order the board that supports the Fusion Drive.

2. If installing a new logic board, transfer these parts from old logic board:

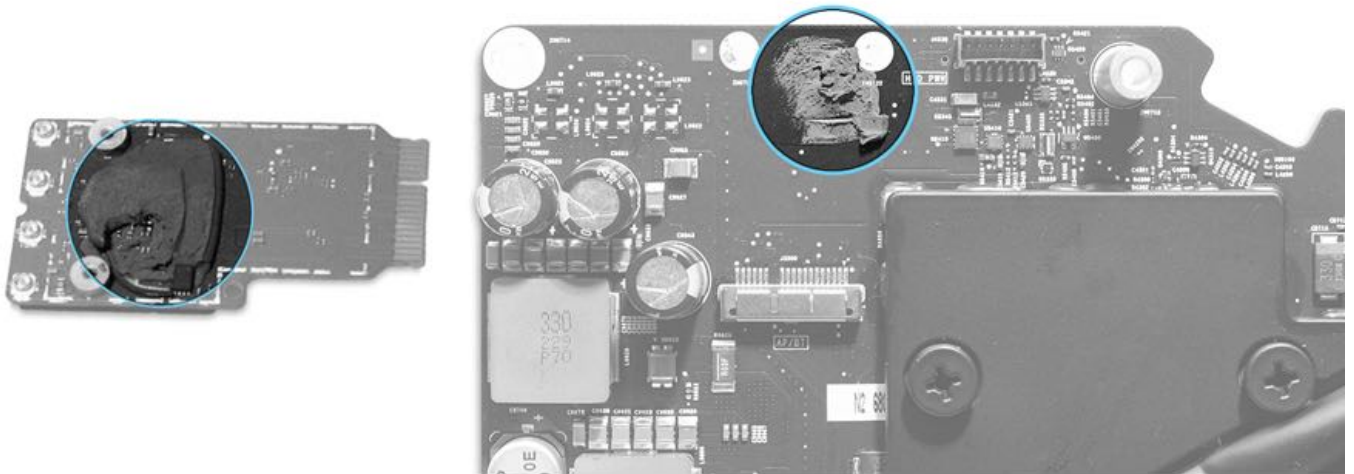
- memory
- solid state drive (SSD) (if present)
- wireless card
- hard drive data cable
- hard drive power cable

3. **Note:** On July 17, 2013, a thermal pad kit (076-1445) replaced the original twinpak of thermal material (076-1425) necessary for installing wireless cards in iMac (Late 2012, Early 2013) models. The thermal pad kit is included with wireless card and logic board replacement parts on the iMac (Late 2012 and Early 2013) models. On the iMac (Late 2013) models, the thermal pad is **only** included with the wireless card. The kit also available separately (076-1445). If your twinpak of thermal material (076-1425) has not expired, you may use it; however, it's much easier, cleaner, and quicker to install a thermal pad.

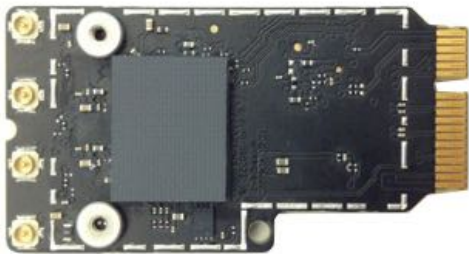
Whenever you remove or replace the wireless card in an iMac (Late 2012, Early 2013), check for a dollop of original thermal material. If present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card. Refer to [RP1034: Wireless Card](#) for complete thermal pad instructions.

If thermal material is present, use a black stick to CAREFULLY remove the thermal material from both logic board and wireless card.

Wireless card and logic board with thermal material

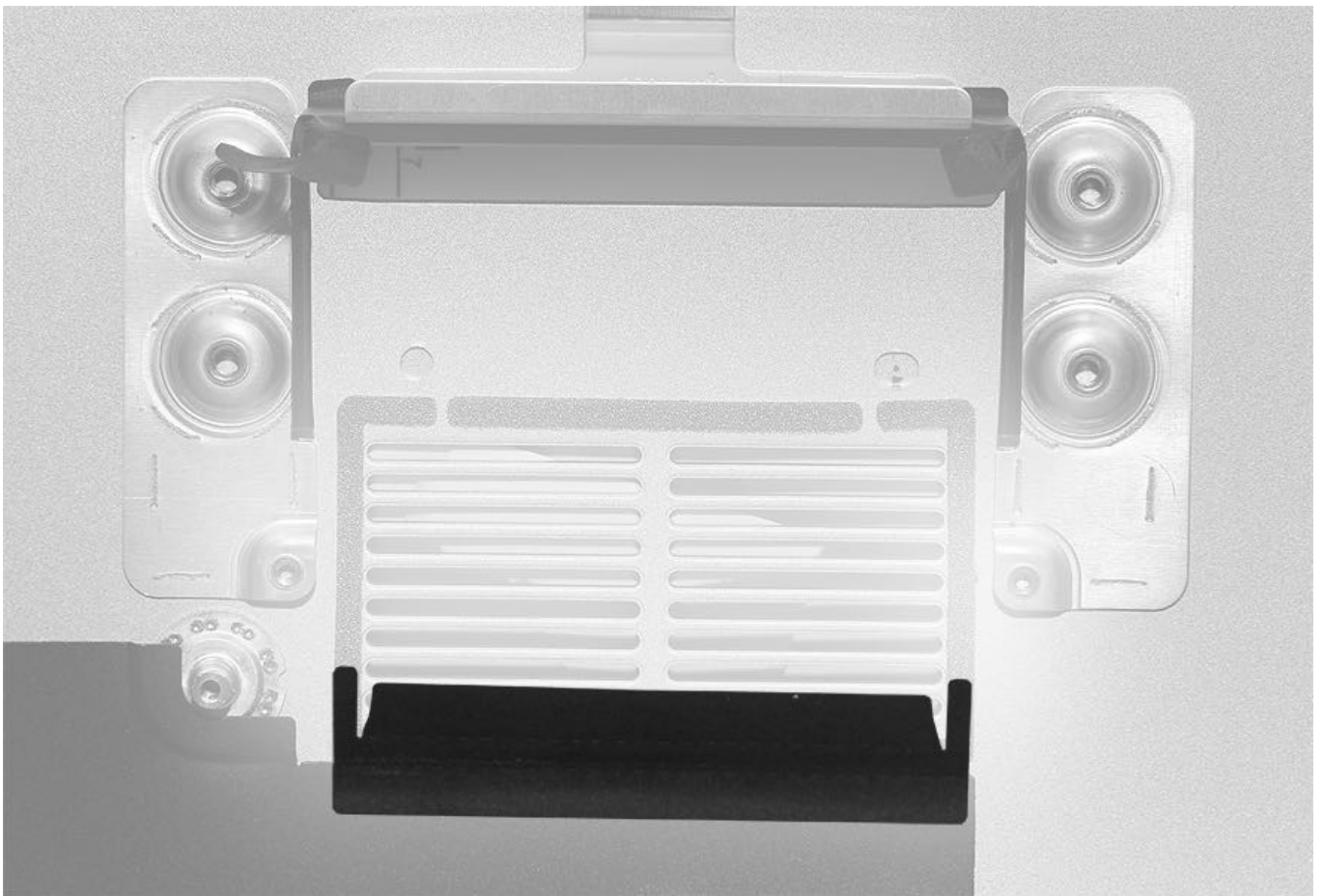


Wireless card with thermal pad

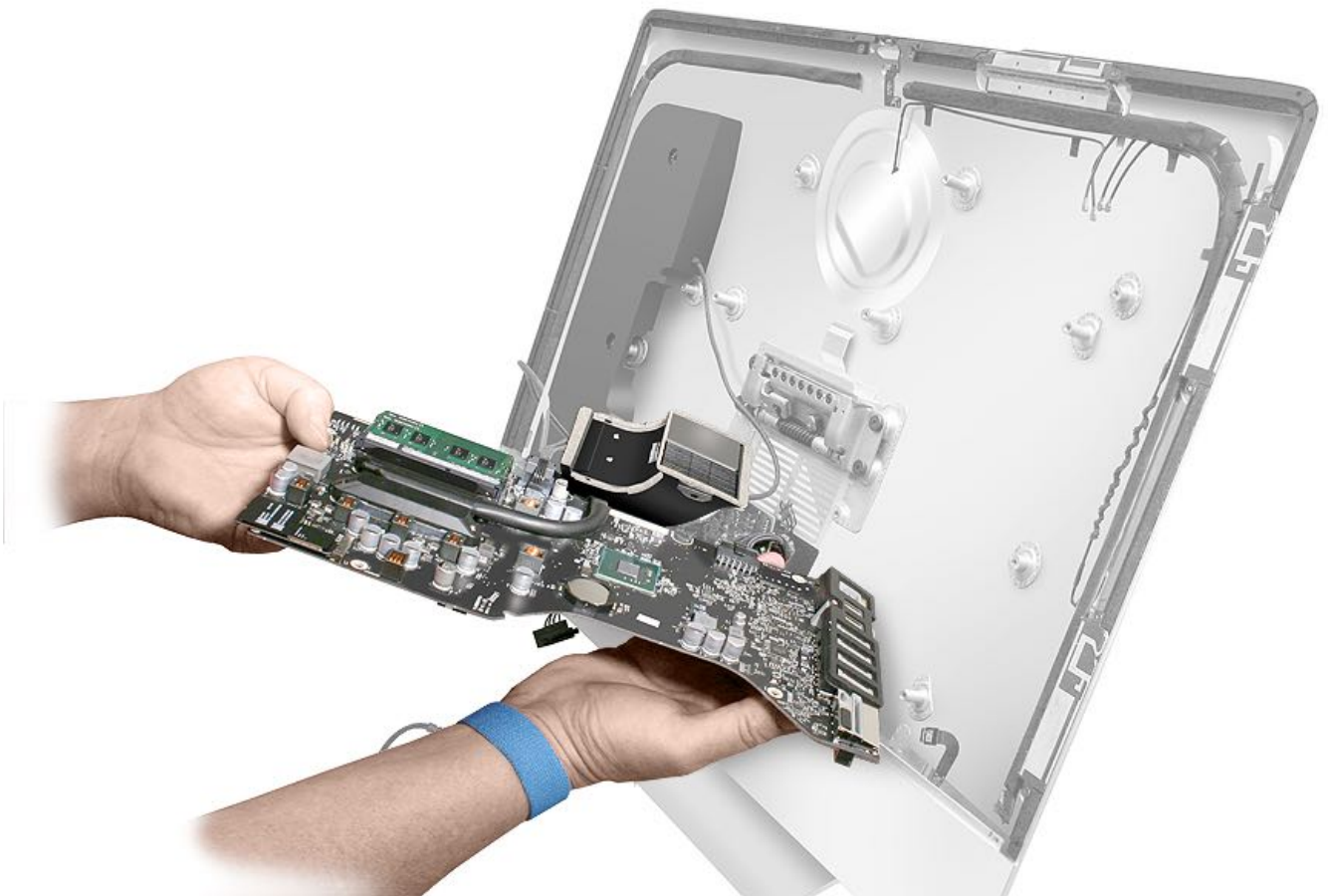


4. iMac (Late 2013)

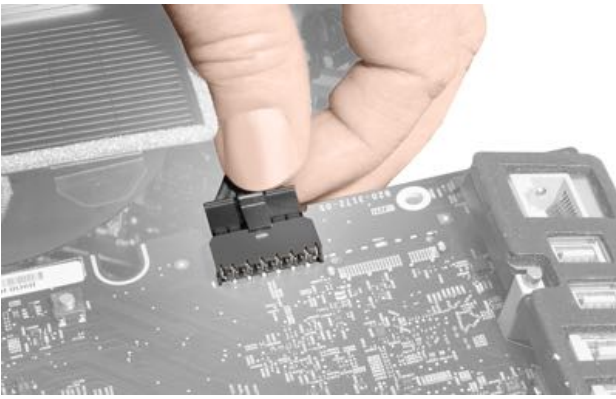
Ensure the insulator is attached to the rear housing before inserting logic board into chin. **Note:** iMac (Late 2012, Early 2013) rear housing does not have an insulator.



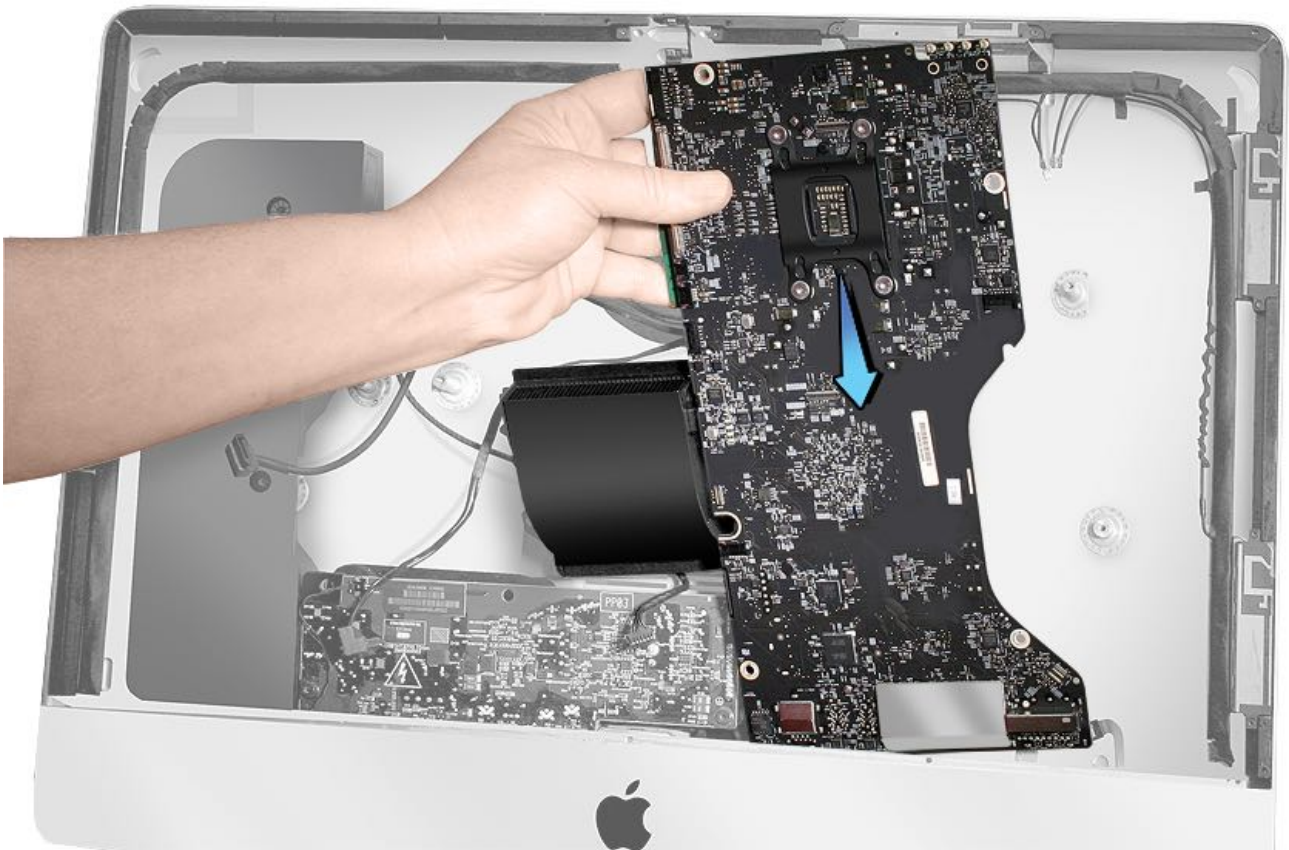
5. Insert logic board part way into chin.



6. Connect the power supply power cable to back side of logic board. **Note:** Make sure the power button cable is tucked into the channel on the left speaker and not loose under the power supply.



7. Set logic board down into the chin area. There are two pins on the I/O connectors that insert into blind holes in the rear housing. Move the logic board with small movements and listen for the pins to click into place.



8. After getting the I/O pins in place, press the logic board down so the I/O gasket doesn't push the pins out.

9. Loosely install two (2) 7.2mm T10 screws, 923-0331, at bottom of logic board first, so you can stop holding the board down.

10. Loosely install the remaining two (2) 7.2mm T10 screws, 923-0331, to logic board. **Do not** tighten them down yet.





Tip: Lay the computer down when installing the heat sink screws so they don't fall into the chin well.

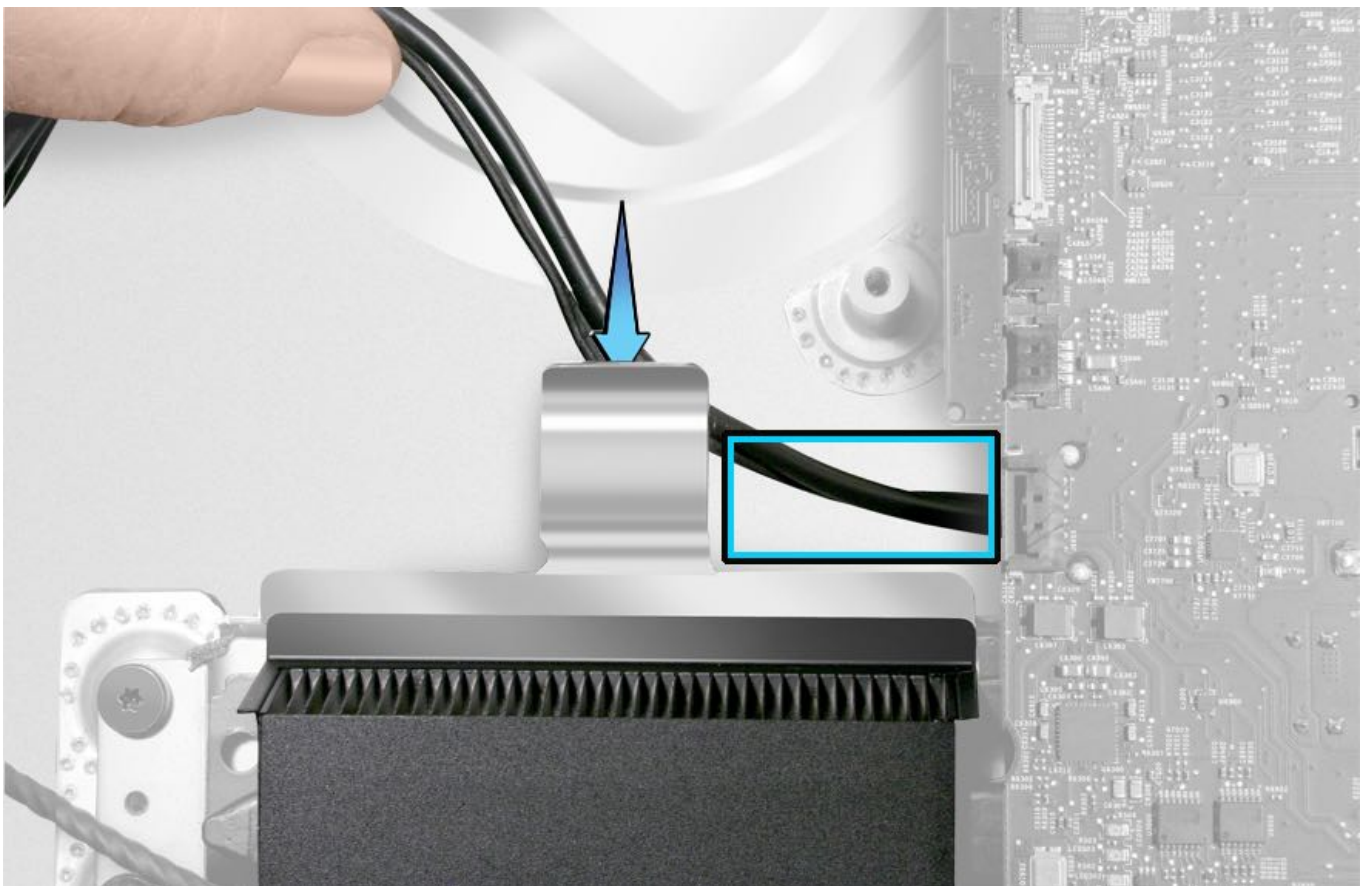
11. Install four (4) T8 screws to the heat sink:

- (2) longer screws, 923-0327, on upper finstack
- (2) shorter screws, 923-0336, on lower finstack





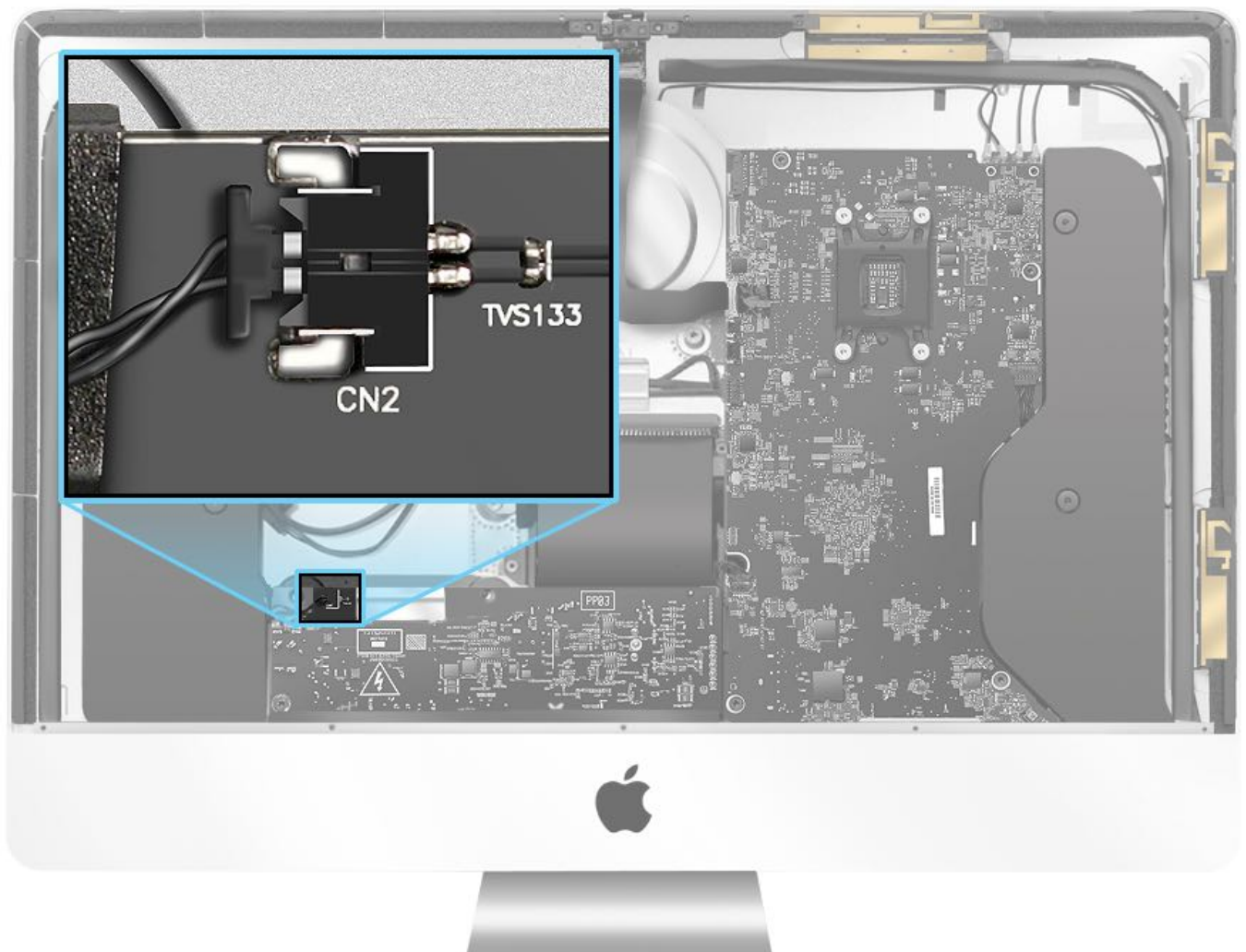
12. Place the hard drive data cable and hard drive power cable into their clip. **Note:** Leave some slack on the hard drive data cable on the logic board side (indicated by blue rectangle).



13. Connect the power supply data cable to the front of logic board. **Note:** Check that the power button cable is tucked into the channel on the left speaker.



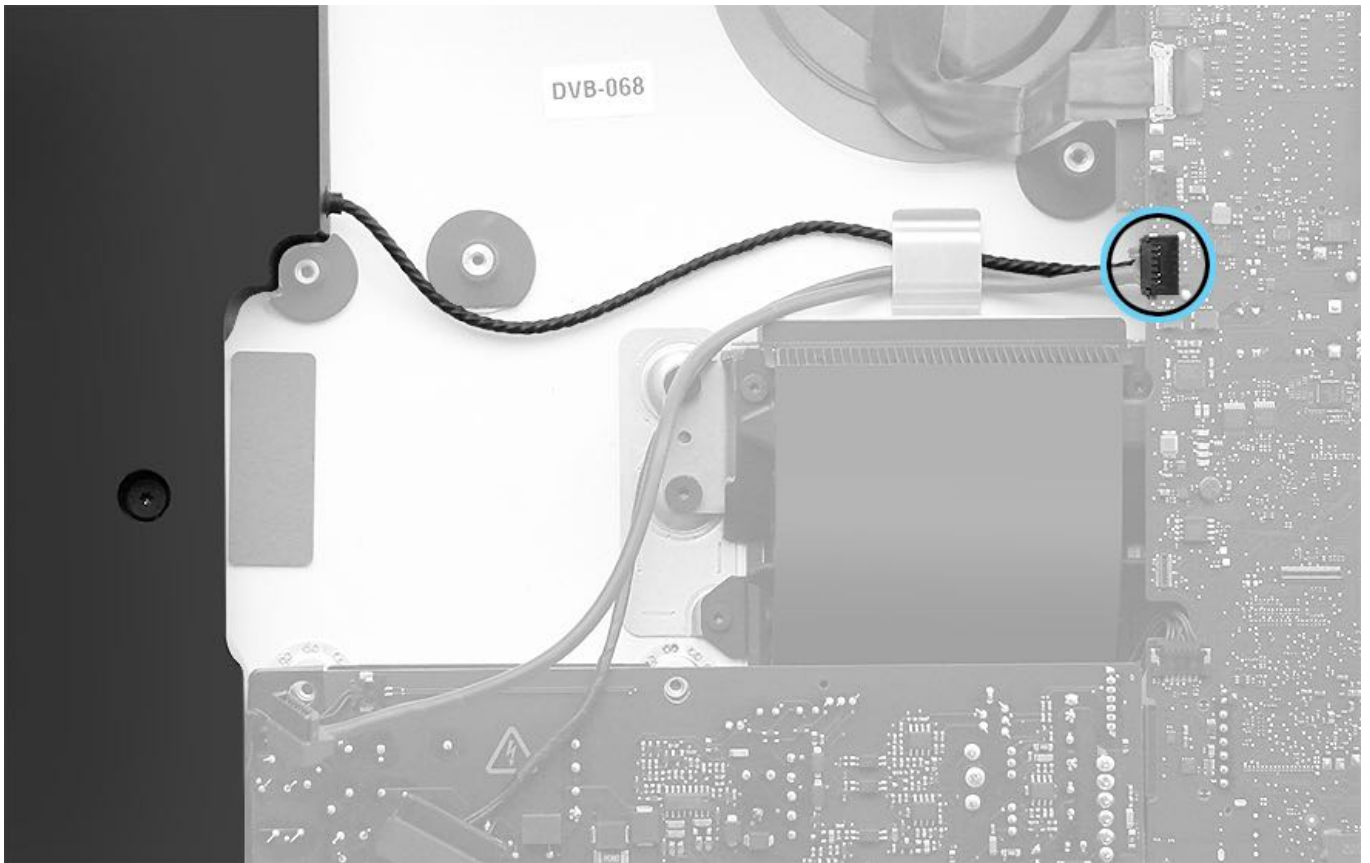
14. Connect power button cable to power supply.



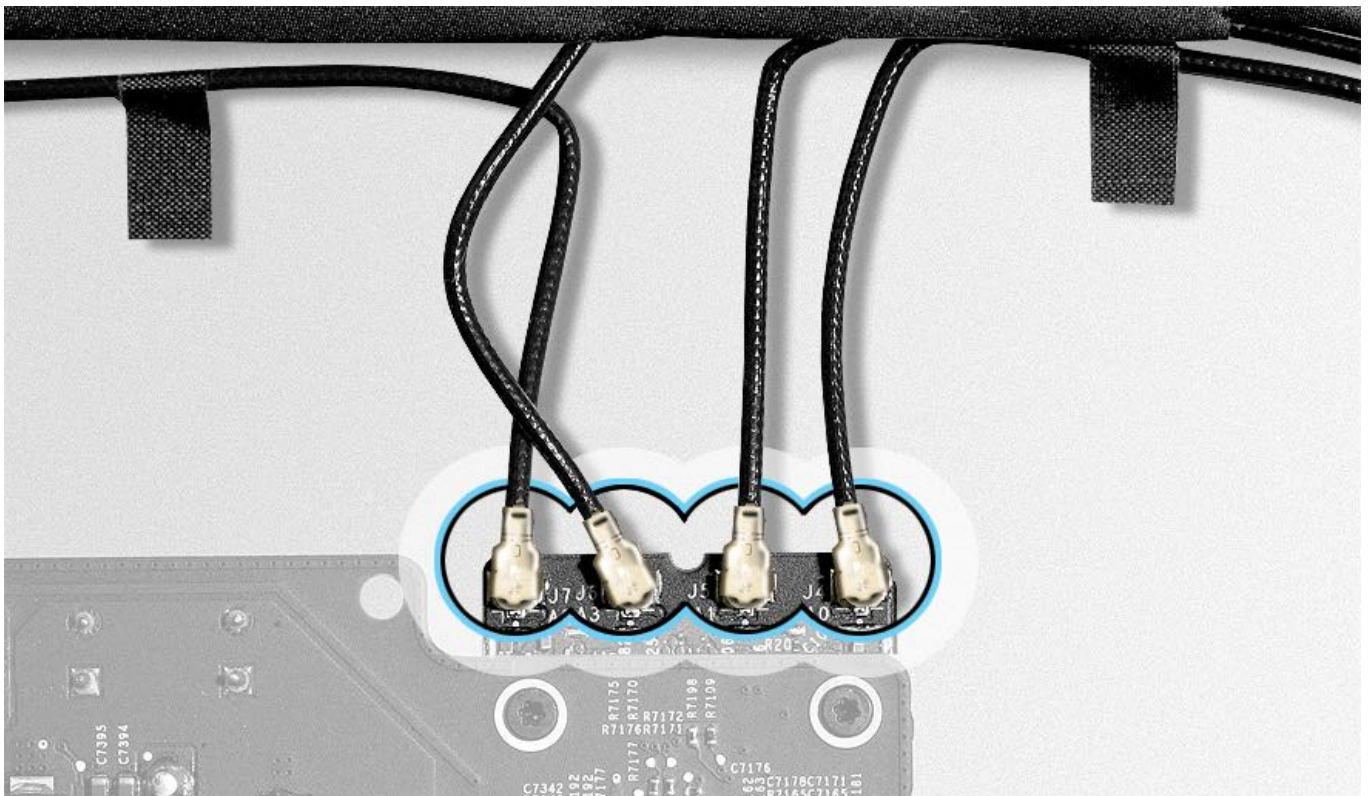
15. Connect camera/microphone cable to logic board. Insert cable straight into connector and flip the locking-lever bar towards logic board. Press around the bar to secure the cable.



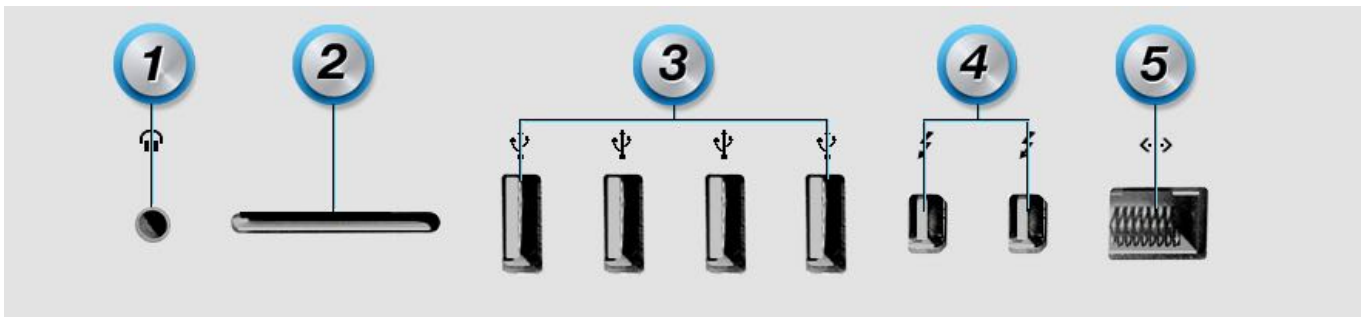
16. Connect left speaker cable to logic board.



17. Connect four (4) antenna cables to the wireless card.



18. To ensure correct logic board alignment with rear housing, plug in an SD card (#2), one USB cable (#3), and two Thunderbolt cables (#4) while tightening the logic board screws.



19. Apply new Ethernet ID label (included in box with new logic board) to bottom of stand.

20. Use the [Blank Board Serializer](#) tool to set computer's serial number on new logic board.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Memory

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

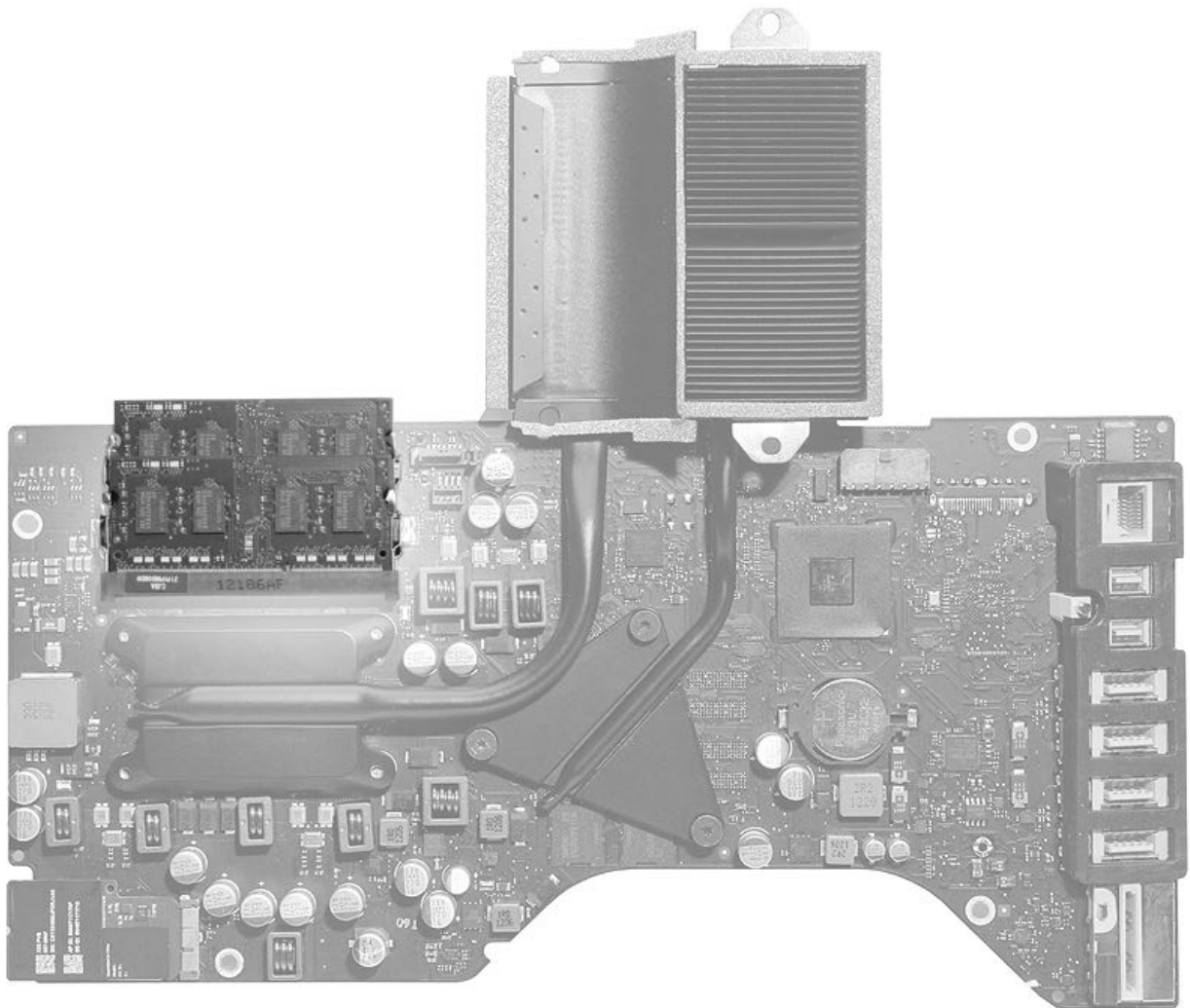
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)
- [Logic Board](#)

Note: The chin strap must be removed for this repair.



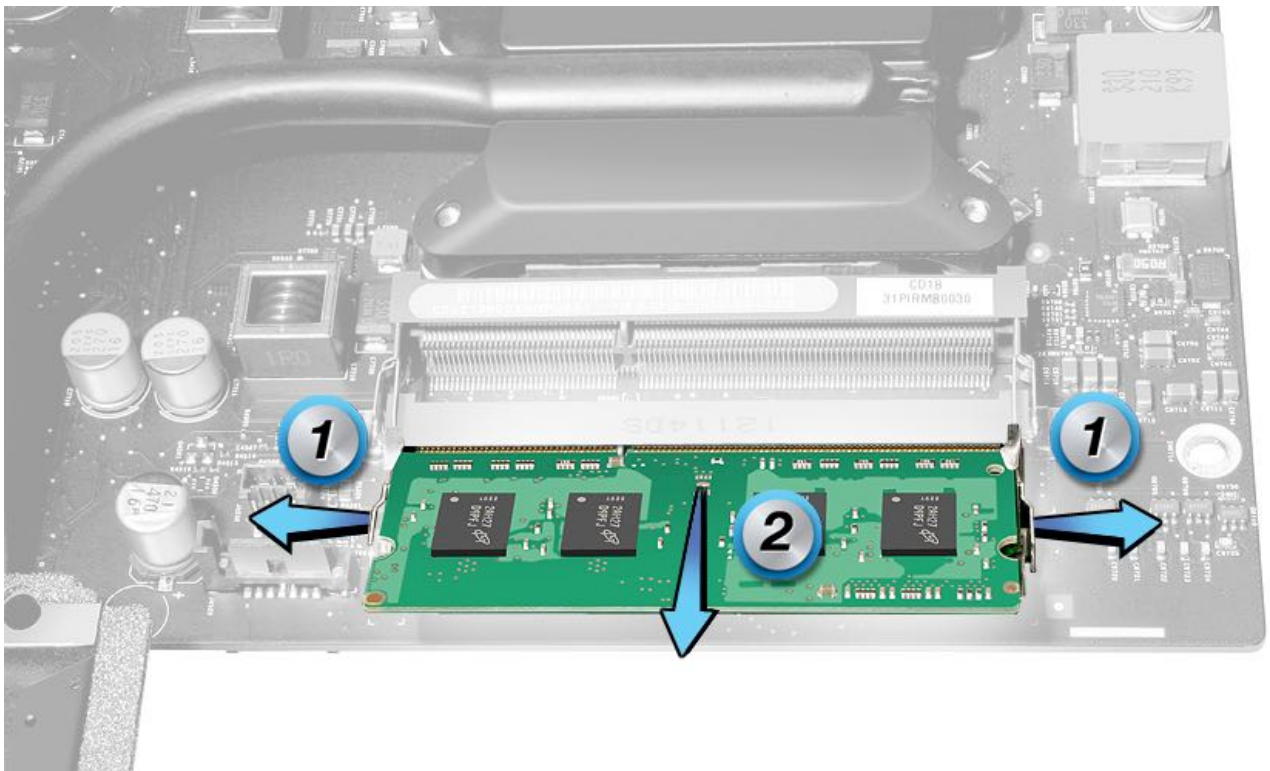
Tools

- ESD wrist strap



Steps For Removal

1. Press side tabs outward to release memory module.
2. Pull memory module out of logic board connector.



Steps For Reassembly

1. Align and insert memory module to logic board connector.
2. Press down until side tabs lock memory module securely into place.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Solid State Drive (SSD) Card or Flash Storage

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

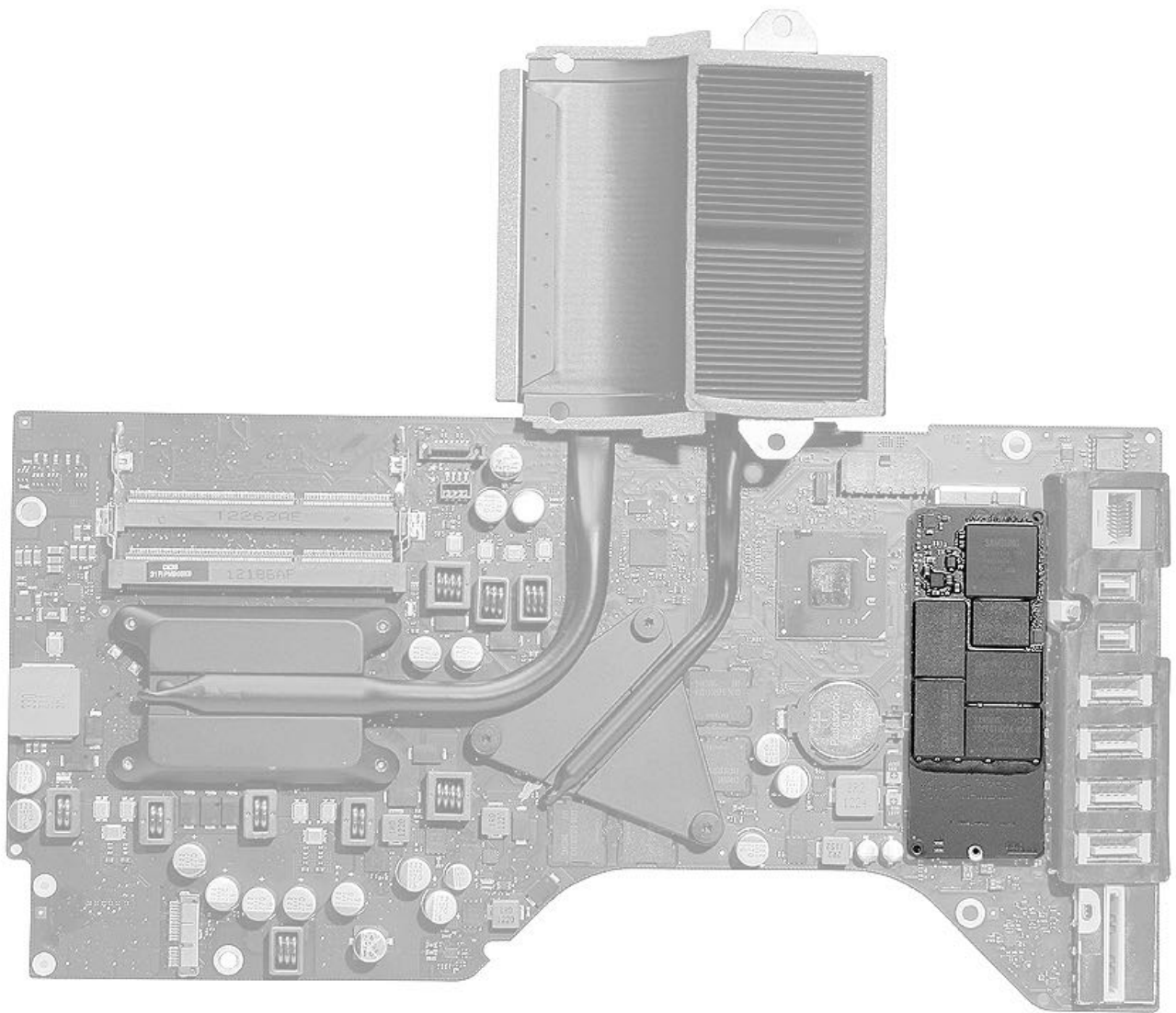
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

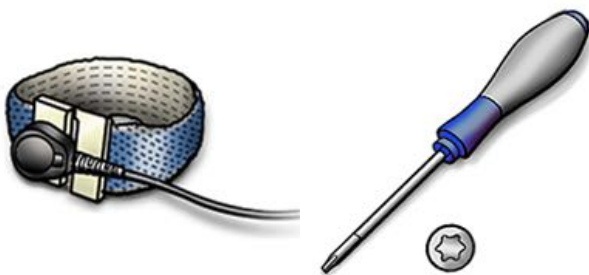
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)
- [Logic Board](#)

Note: The chin strap must be removed for this repair.



Tools

- ESD mat and wrist strap
- Magnetized Torx 8 screwdriver

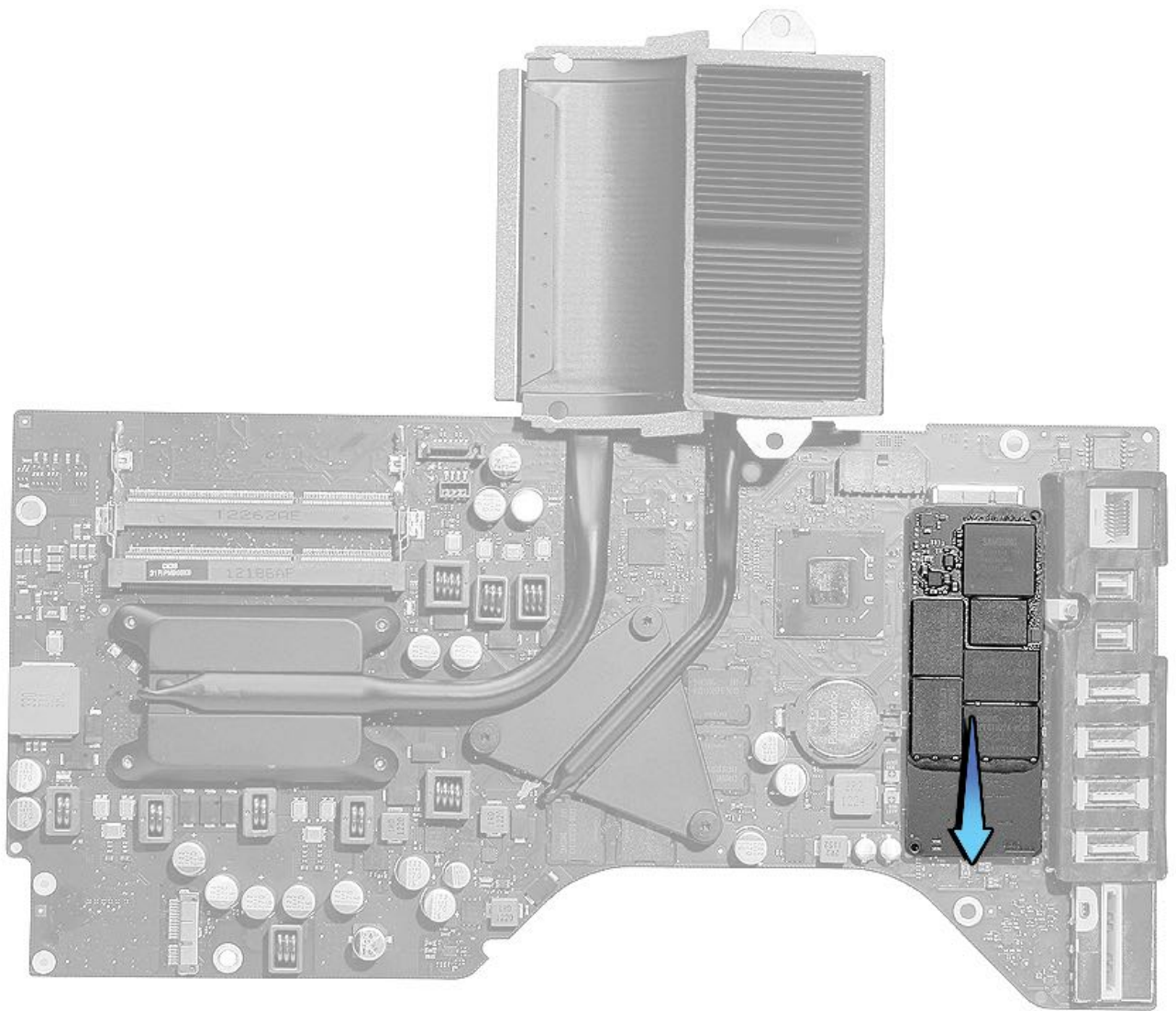


Steps For Removal

Note: The Solid State Drive (SSD)/Flash Storage is on the back of the logic board. (Beginning in 2013, "flash storage" is the approved term for use.)

Caution: Make sure data is backed up before removing SSD card or flash storage.

1. Remove one (1) T8 screw, 923-0328.
2. Pull SSD or flash storage straight out of the connector.



Steps For Reassembly

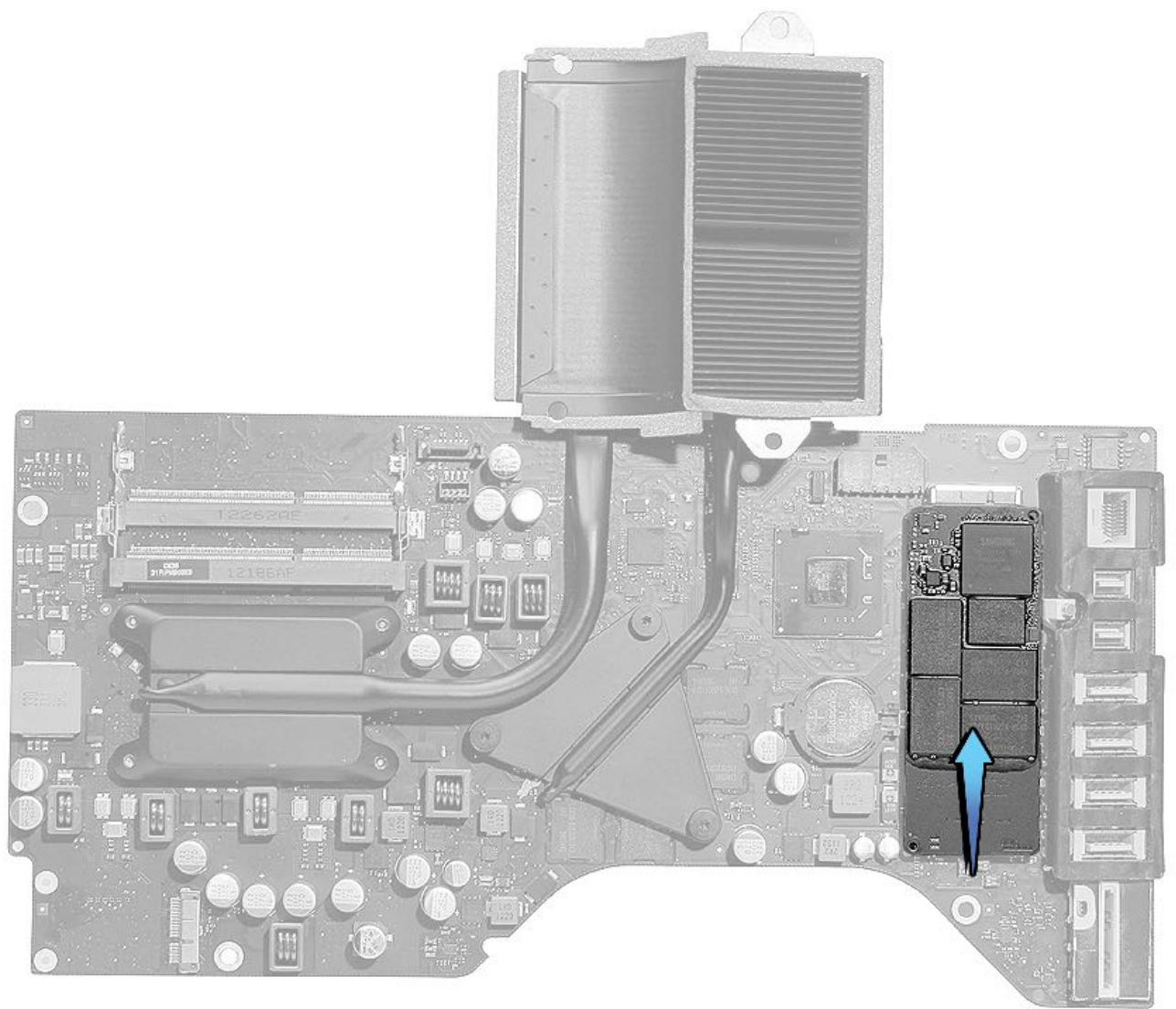
1. Before installing a replacement SSD card/flash storage card in the computer, remove the compliance label on the underside of the card.



2. Insert SSD or flash storage straight into the connector on back of logic board.

2. Install one (1) T8 screw, 923-0328.

3. See Apple Support article [TP767: Reinstalling Software That Came with the Computer.](#)



Portables and Desktops Late 2011 or later: Reinstalling Software That Came with the Computer

Refer to Apple Support article [HT4718: OS X: About OS X Recovery](https://support.apple.com/HT4718).

Connection to the Internet is required to complete this procedure.

Important: Apple recommends backing up data before restoring software. Back up essential files before installing OS X and other applications. Apple is not responsible for any loss of data.

1. Choose Apple menu > Restart, and then hold down the Command (⌘) and R keys while your computer restarts.
Note: To force OS X Lion or OS X Mountain Lion into Internet Recovery, press and hold the Command-Option-R key combination when starting up the computer.
2. If you're not connected to the Internet, choose a network from the Wi-Fi menu (in the top-right corner of the screen).
3. Select reinstall OS X, and then click Continue.
4. Follow the onscreen instructions. In the pane where you select a disk, select your current OS X disk (in most cases, it is the only one available).
5. To start the installation, click Install.

Check for and apply the latest software and firmware updates.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Wireless Card

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

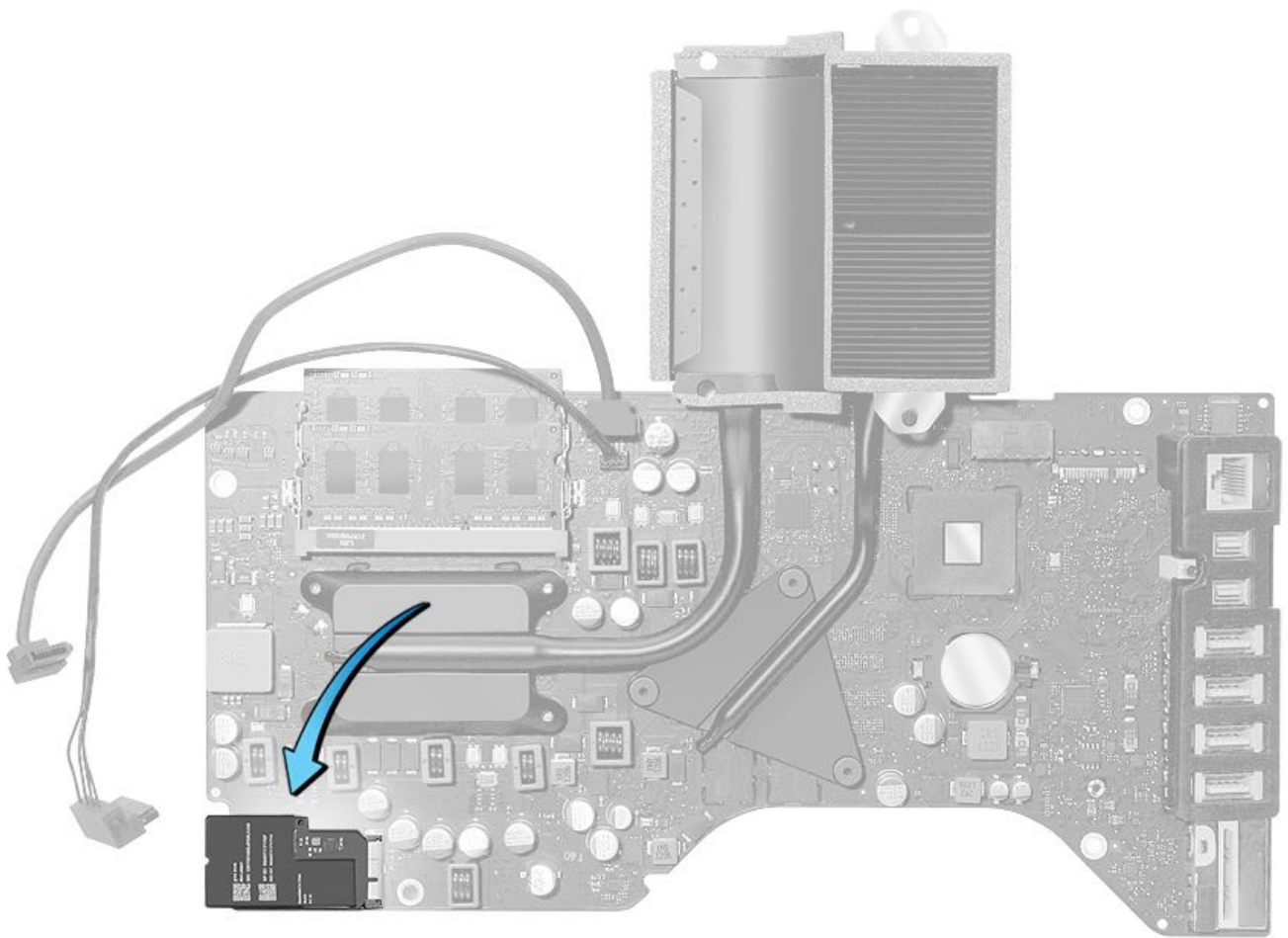
Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)
- [Logic Board](#)

Note: The chin strap must be removed for this repair.

Caution: Do not remove the wireless card without taking out the logic board. Attempting wireless card removal is likely to damage both the wireless card and the logic board. Additionally, the use of thermal material during installation will make inserting the card problematic without logic board removal.



Tools

- ESD wrist strap
- Magnetized Torx 4 screwdriver
- Safety goggles (use when cleaning twinpak thermal material)
- Nitrile gloves (use when cleaning twinpak thermal material)
- Black stick
- Thermal pad kit, 076-1445 (replaces the twinpak thermal material)
- Isopropyl wipes (IPA)
- Thermal material, Twinpak, 076-1425 (may use if thermal material is not expired, check back of packet)
- Kapton tape (use when applying twinpak thermal material)

Note: On July 17, 2013, a thermal pad kit (076-1445) replaced the original twinpak of thermal material (076-1425) necessary for installing wireless cards in iMac (Late 2012, Early 2013) models. The thermal pad kit is included with wireless card and logic board replacement parts on the iMac (Late 2012 and Early 2013) models. On the iMac (Late 2013) models, the thermal pad is **only** included with the wireless card. The kit also available separately (076-1445). If your twinpak of thermal material (076-1425) has not expired, you may use it; however, it's much easier, cleaner, and quicker to install a thermal pad.

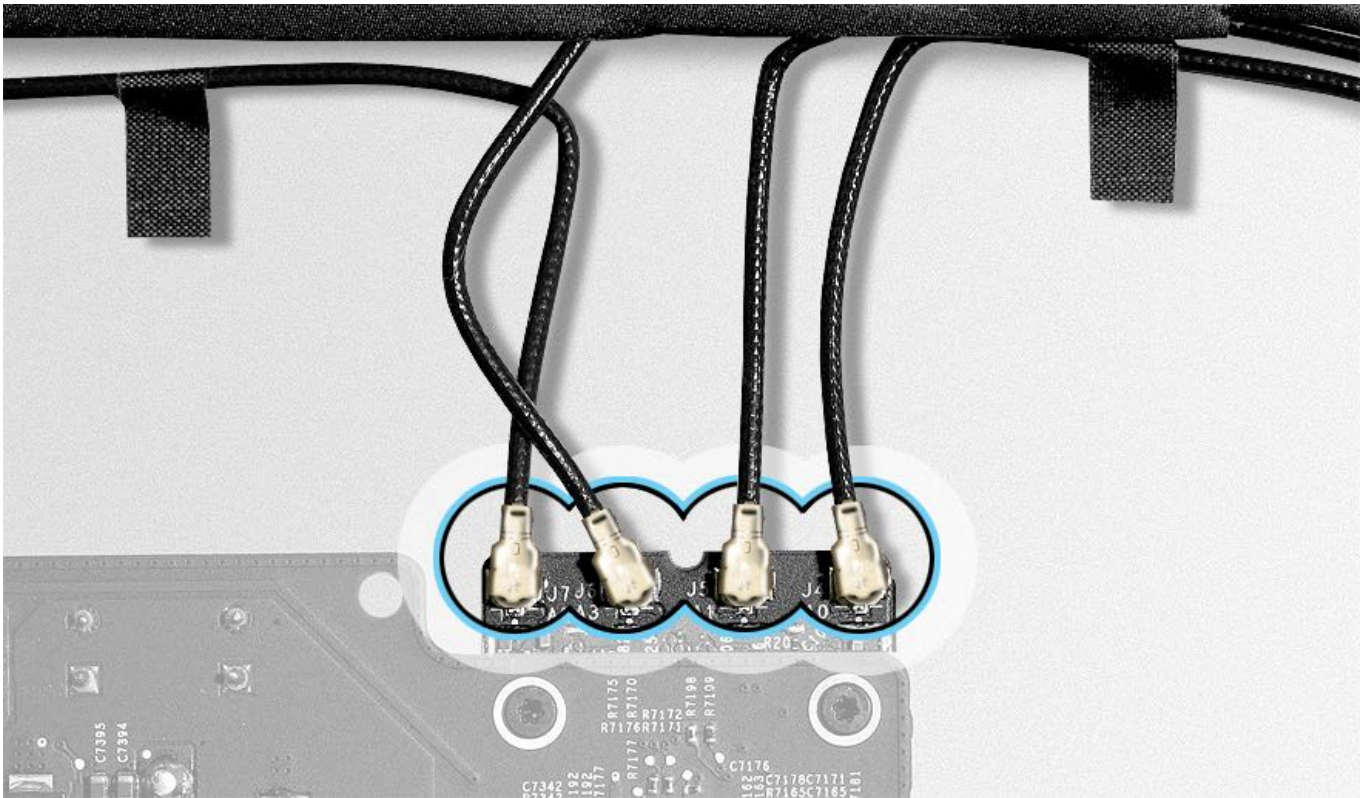
Whenever you remove or replace the wireless card in an iMac (Late 2012, Early 2013) model check for a dollop of original thermal material. If present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.



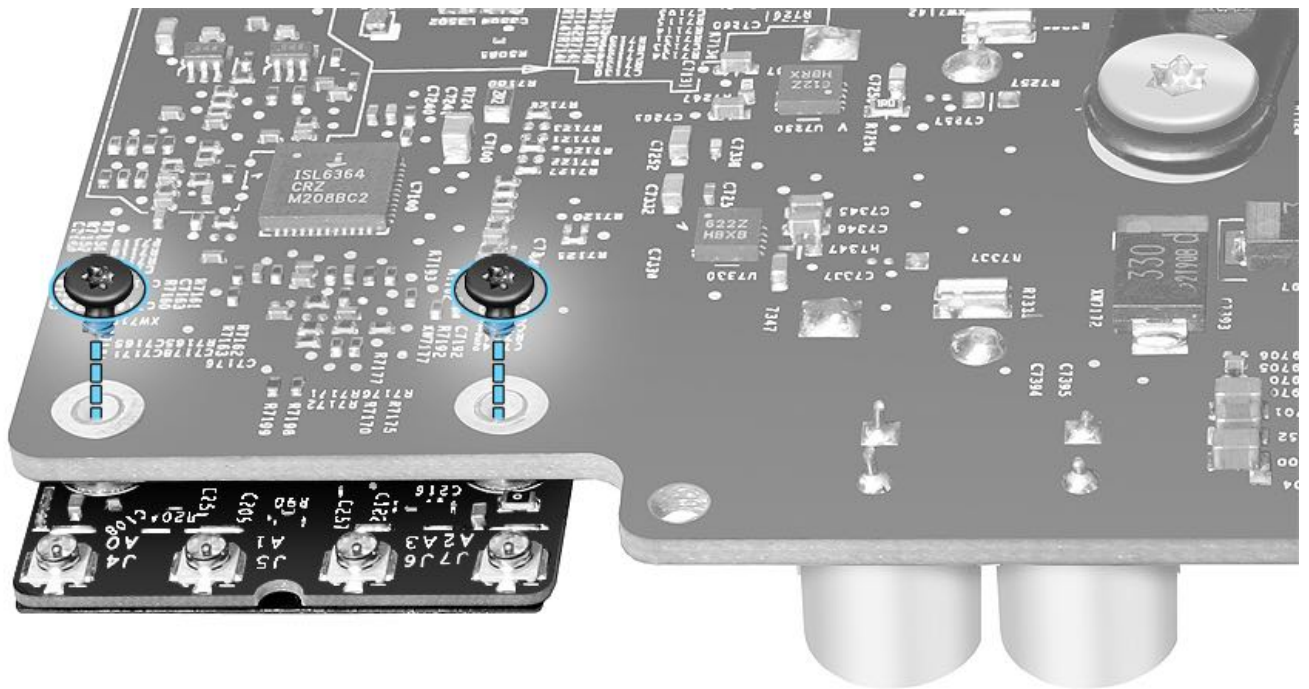


Steps For Removal

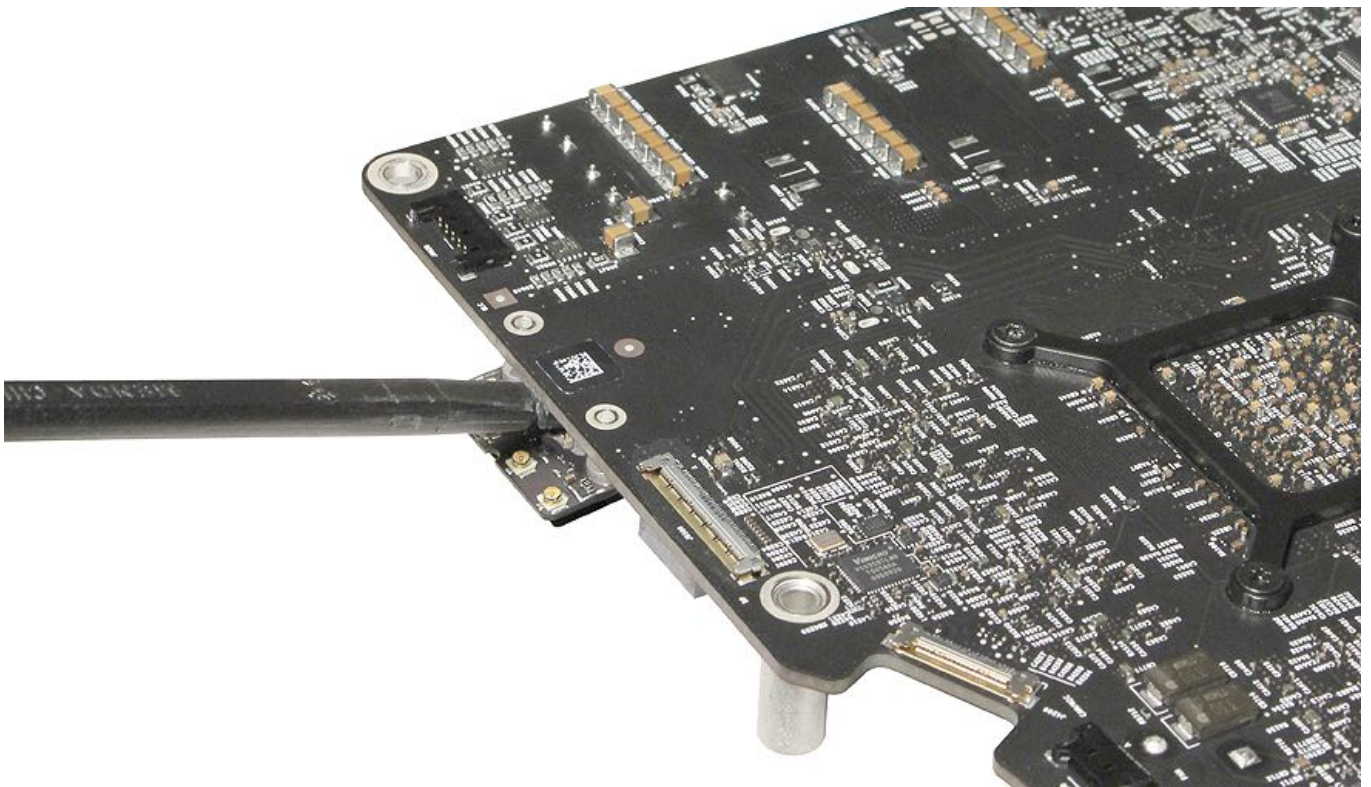
1. Disconnect four (4) antenna cables from wireless card.



2. Remove two (2) T4 screws (923-0330) that secure wireless card to logic board.

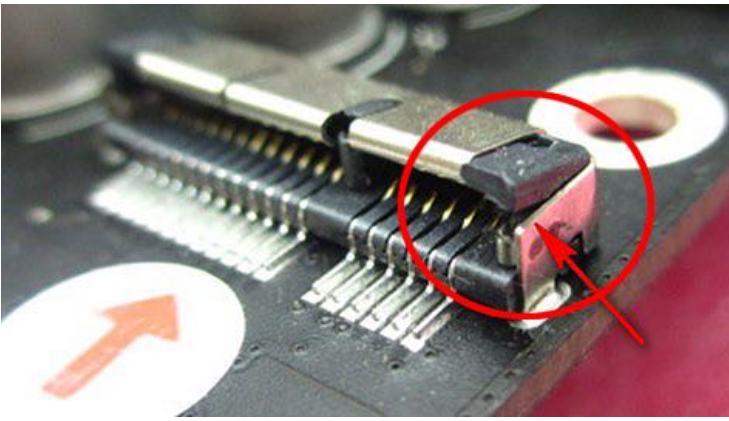


3. Use a black stick to gently loosen the bond of thermal material between logic board and wireless card. **Important:** Exerting too much force when trying to loosen the bond of the thermal material could damage the wireless card connector (see step 4).

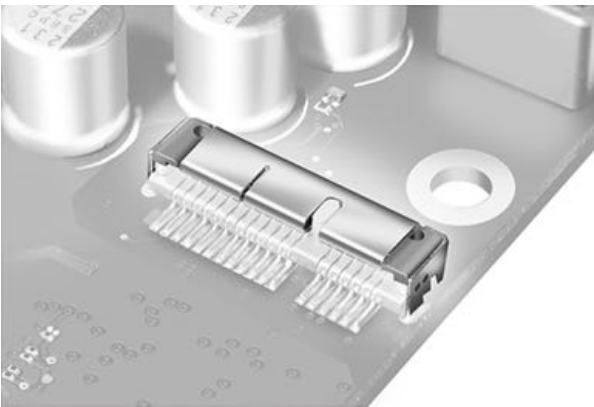


4. **Important:** A damaged wireless card connector requires a logic board replacement. **Note:** Damaged iMac (21.5-inch, Late 2012) wireless connector shown.

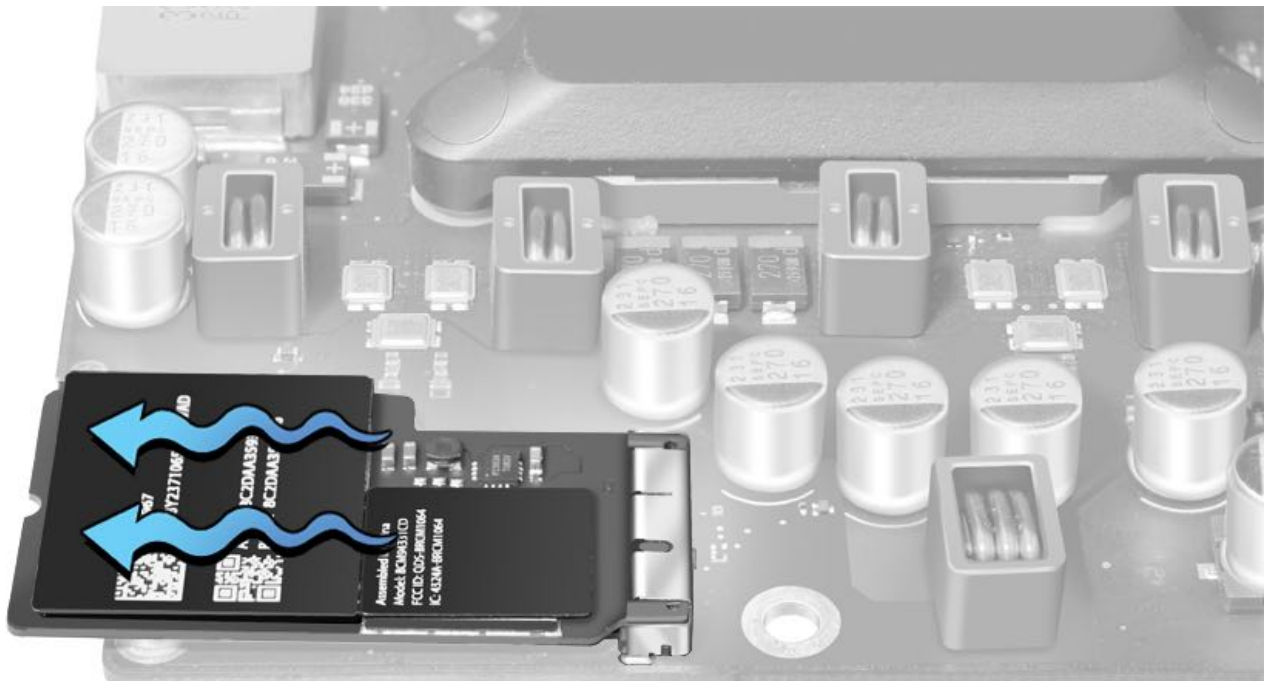
Damaged Wireless Card Connector



Wireless Card Connector With No Damage



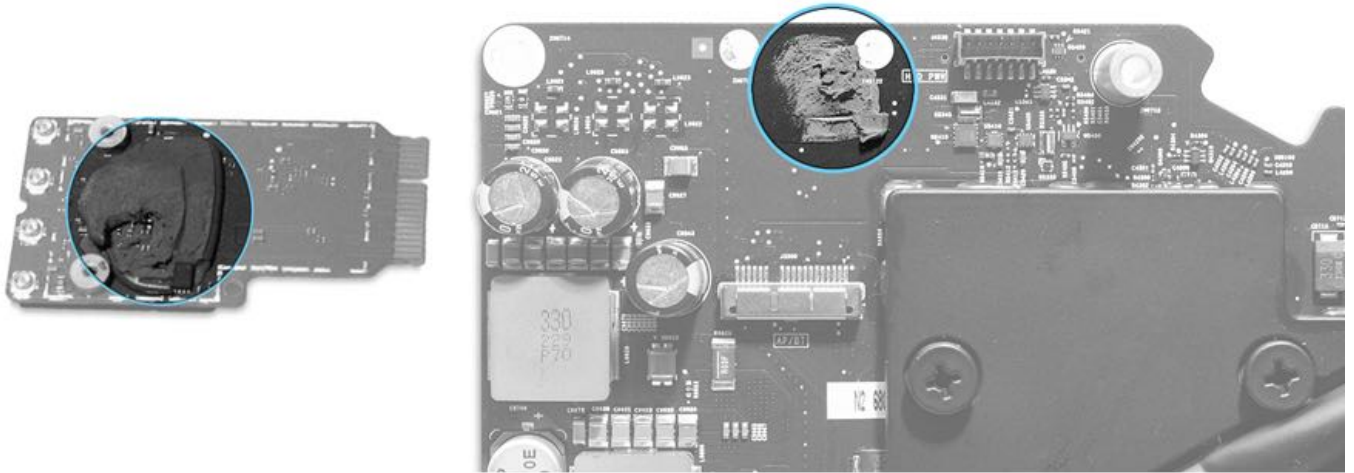
5. **Gently** wiggle the wireless card out of the wireless card connector on logic board.



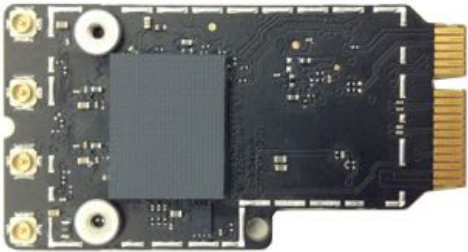
6. If thermal material is present, use a black stick to **CAREFULLY** remove the thermal material from both logic board and wireless card.

- If the card has a thermal pad, follow Reassembly steps 1-6.
- If you prefer to use the non-expired thermal material you have in stock, follow Reassembly steps 7-17. **Note:** Check the back of the twinpak for the expiration date.

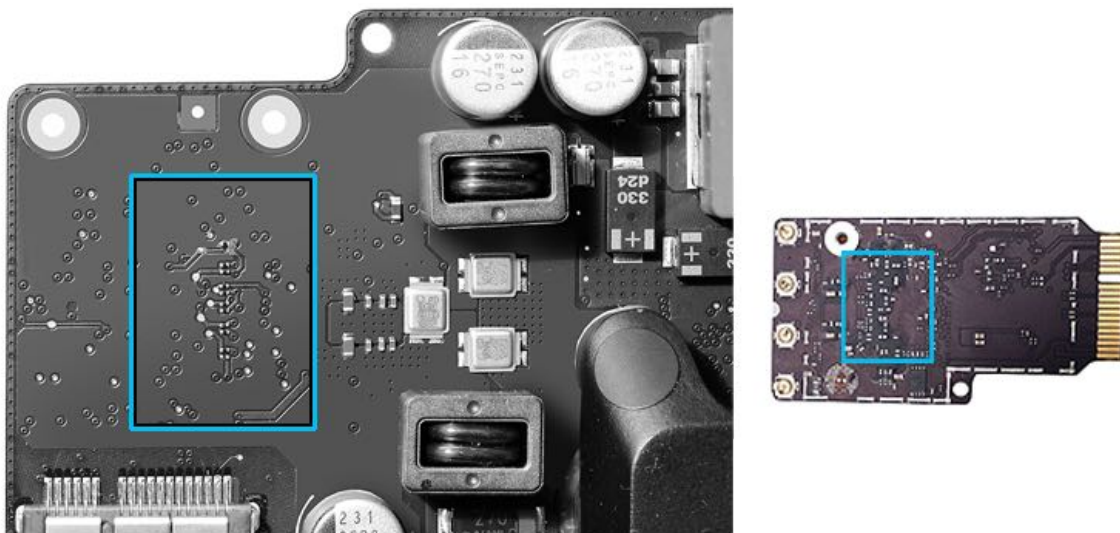
Wireless card and logic board with thermal material



Wireless card with thermal pad



7. Be very careful removing thermal material from the logic board as harsh scraping can damage the resistors shown below. Clean both modules with IPA wipes.



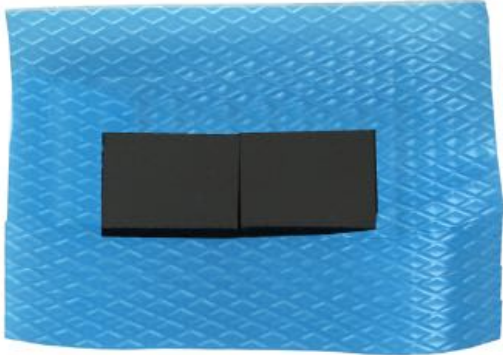
Steps For Reassembly

1. **Note:** On July 17, 2013, a thermal pad kit (076-1445) replaced the original twinpak of thermal material (076-1425) necessary for installing wireless cards in iMac (Late 2012, Early 2013) models. The thermal pad kit is included with wireless card and logic board replacement parts on the iMac (Late 2012 and Early 2013) models. On the iMac (Late 2013) models,

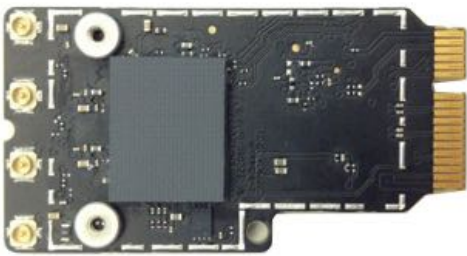
the thermal pad is **only** included with the wireless card. The kit also available separately (076-1445). If your twinpak of thermal material (076-1425) has not expired, you may use it; however, it's much easier, cleaner, and quicker to install a thermal pad.

Whenever you remove or replace the wireless card in an iMac (Late 2012, Early 2013) model check for a dollop of original thermal material. If present, remove the original thermal material, clean with an IPA wipe, and install one thermal pad to the wireless card.

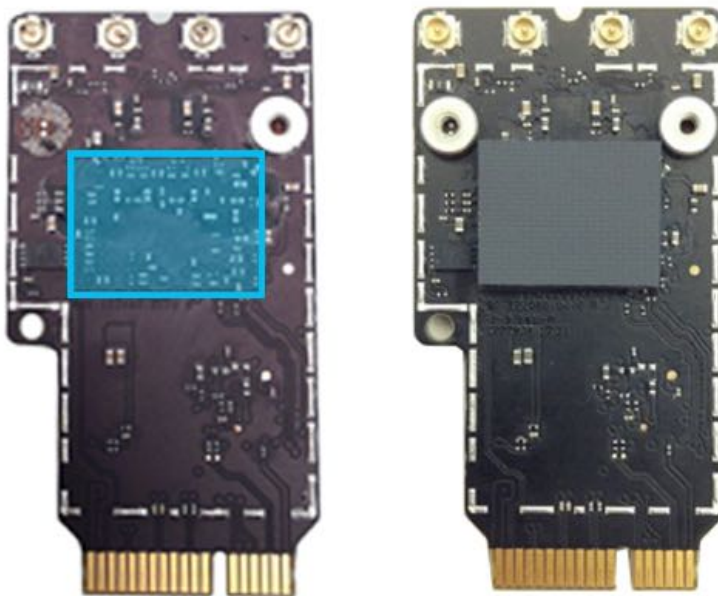
Thermal pads



2. If the card has a thermal pad installed, check the condition of the thermal pad. Transfer the thermal pad to the replacement wireless card (unless it appears to be losing adhesion or is damaged).



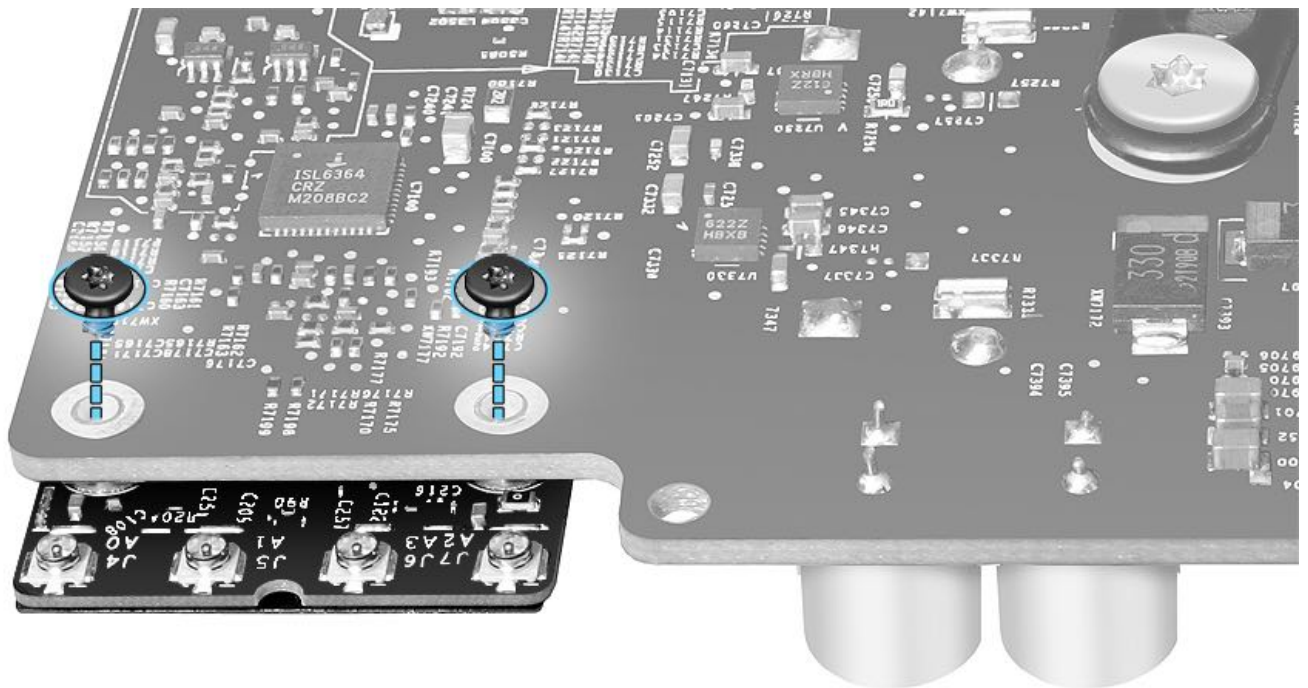
3. If the wireless card needs a thermal pad, attach one new thermal pad to the area indicated.



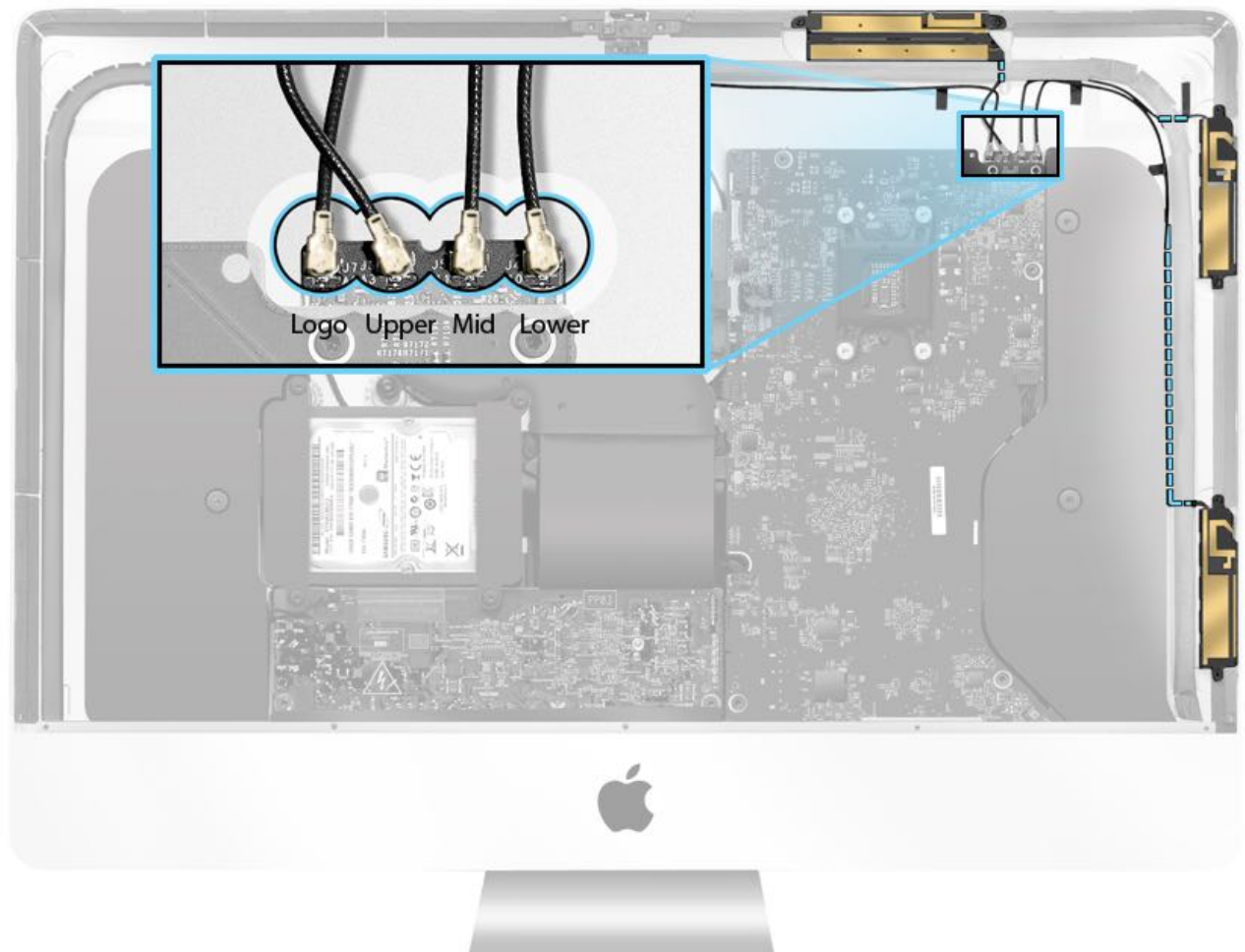
4. Align wireless card and slide into connector on logic board.



5. Replace two (2) T4 screws (923-0330) to logic board.



6. After installing logic board, connect antenna cables using the routing below. The logo antenna is the left-most connector, then continue attaching the antennas clockwise.



Important: Follow steps 7-17 only if you prefer to use the non-expired thermal material you have in stock. Check the back of the twinpak for the expiration date.

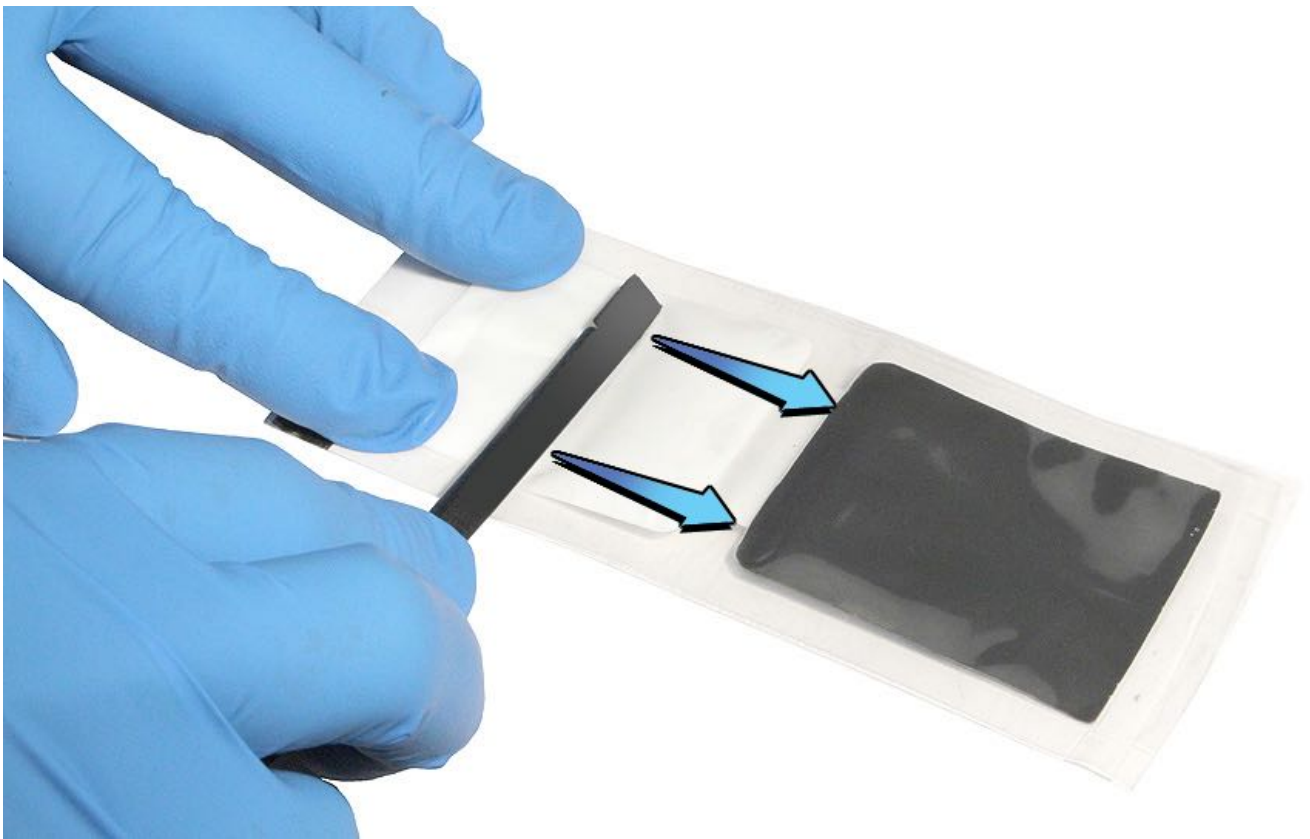
7. Locate burstable twinpak of thermal material.

Important:

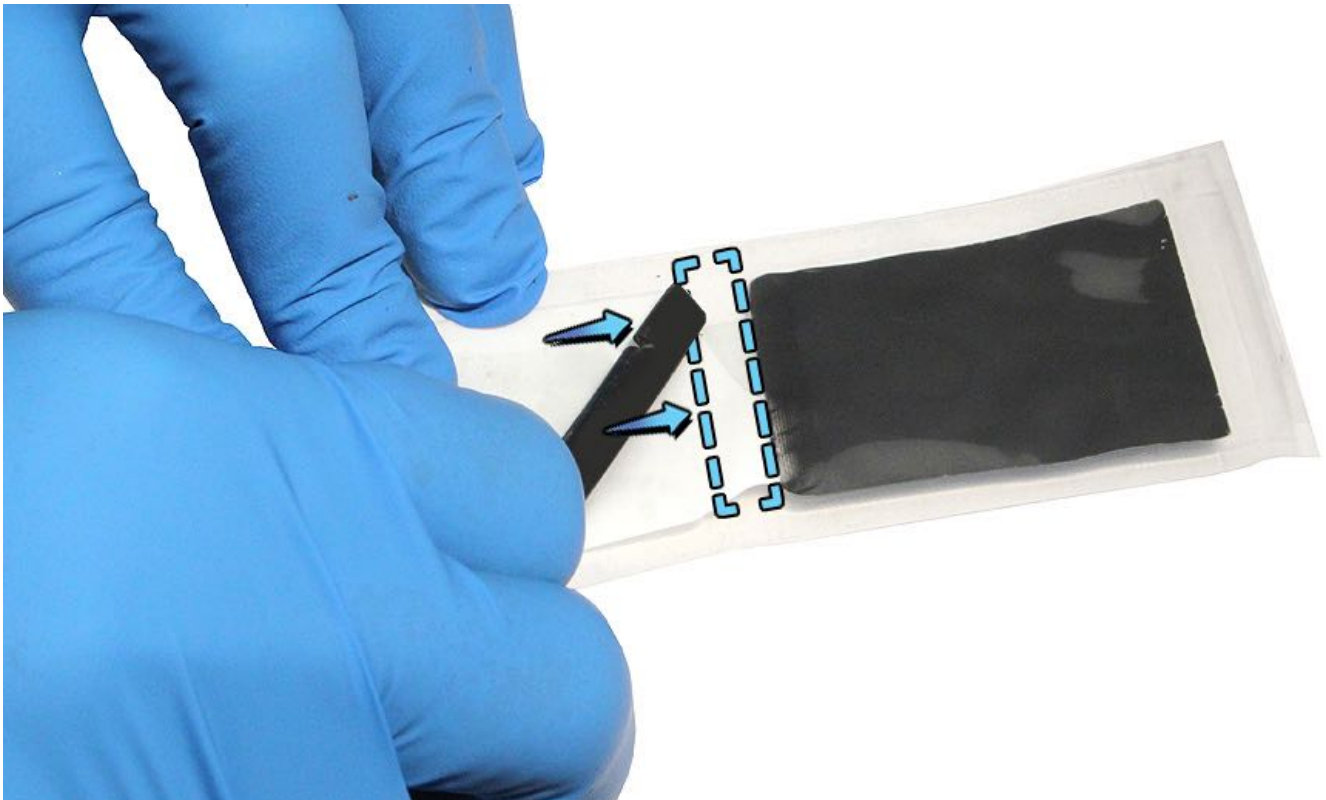
- The thermal material requires mixing before applying to the wireless card.
- You have 15 minutes from start to finish to mix, apply the material, and install the wireless card before the thermal material cures.



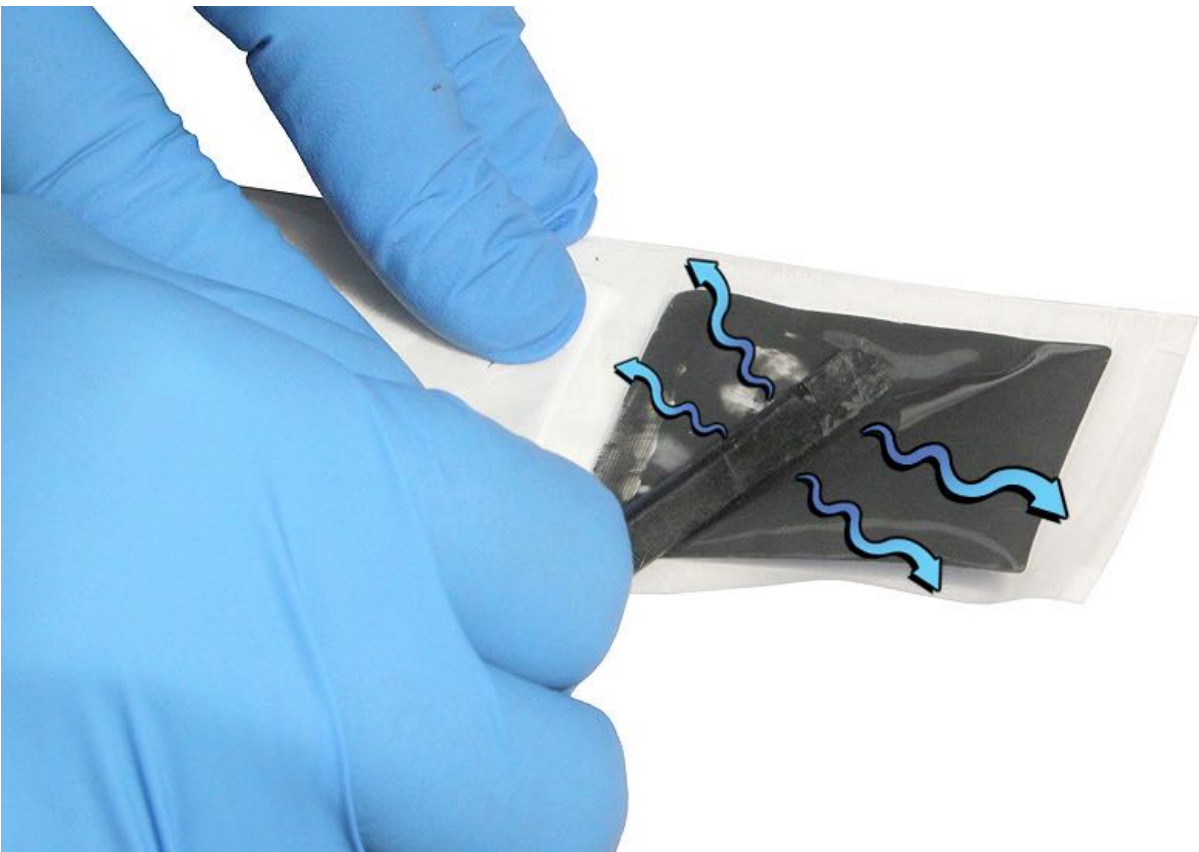
8. Using a black stick, push the material from one side of twinpak sleeve to the other side of twinpak sleeve.



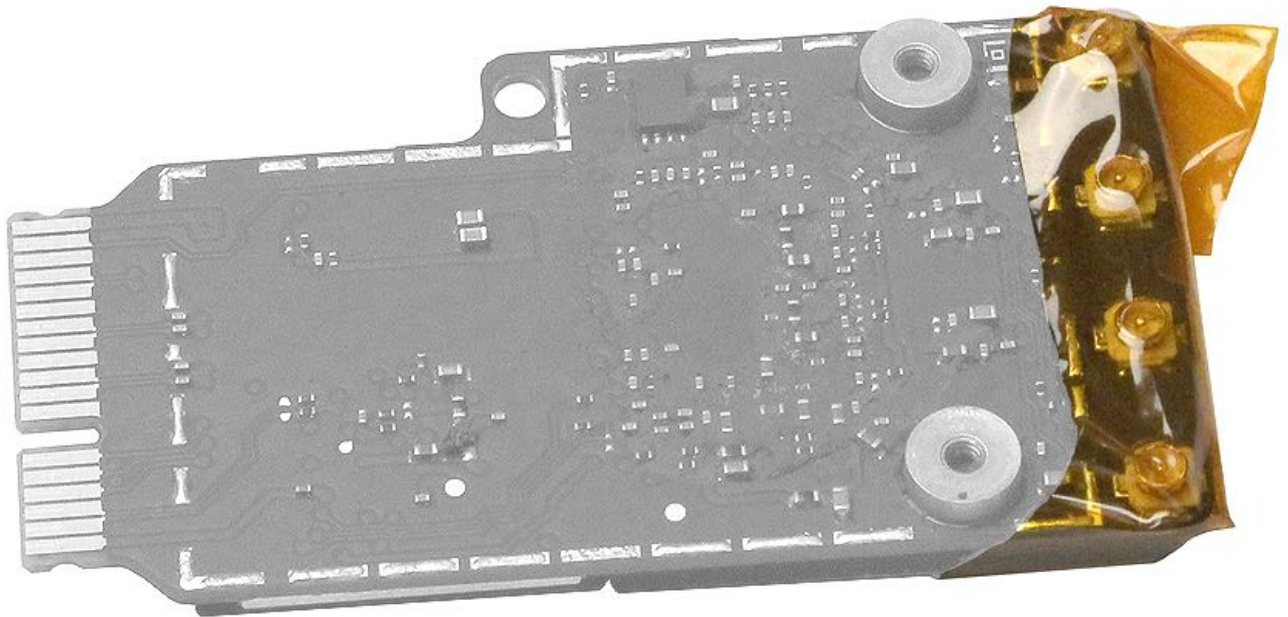
9. Continue pushing the material with the black stick to burst the twinpak in the middle. Push the white material into the black material.



10. Mix the contents of the twinpak back and forth, until the thermal material is uniform in color. If you see striations or non-uniform color, continue mixing.



11. Before applying the thermal material, cover the wireless card connectors with Kapton tape to prevent contaminating the antenna cable connectors. The Kapton tape will be removed once the thermal material has been applied to the wireless card.

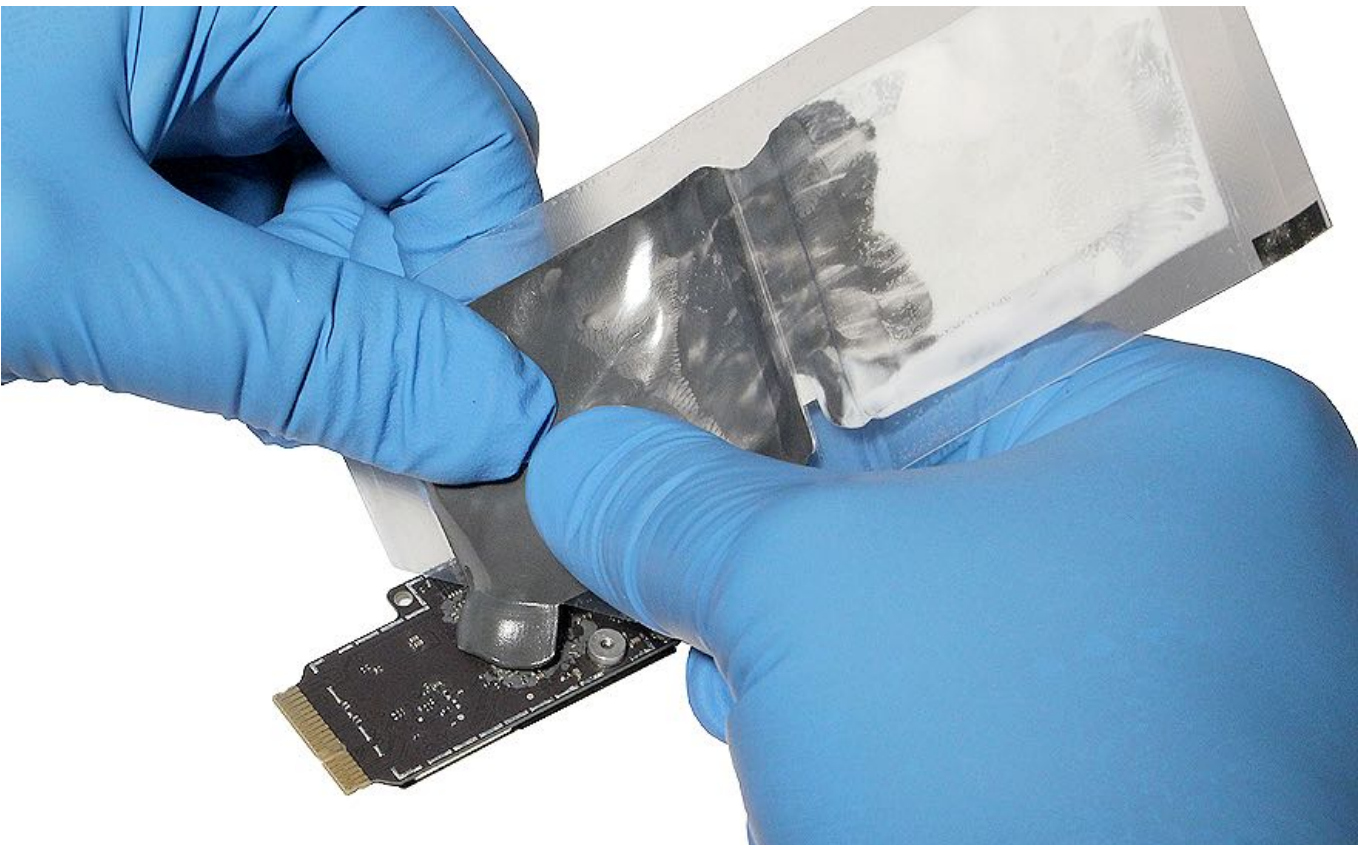


12. Cut the corner of the twinpak sleeve.

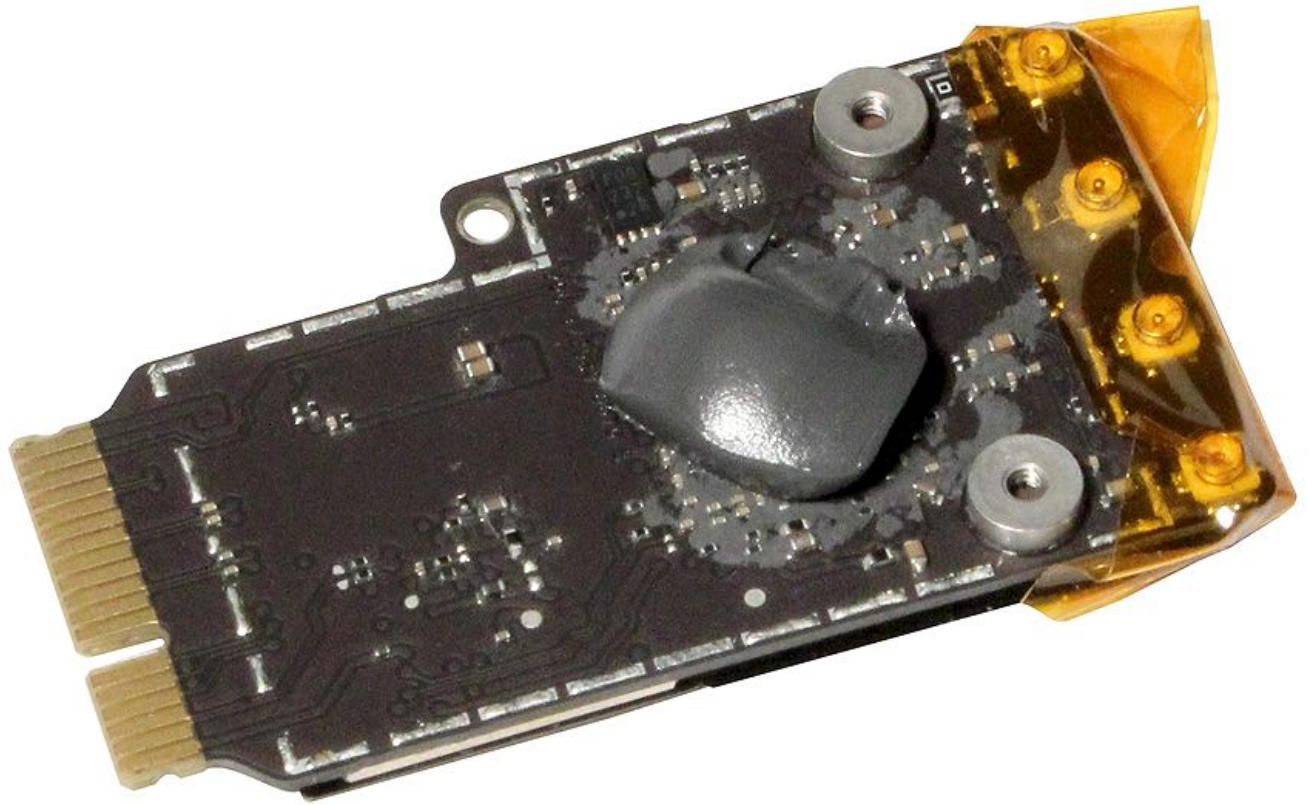


13. Squeeze approximately a quarter of the packet or a 0.5 inch (12.7mm) strip onto the wireless card as shown.

Note: Dispose of excess thermal material according to your local environmental laws and guidelines.



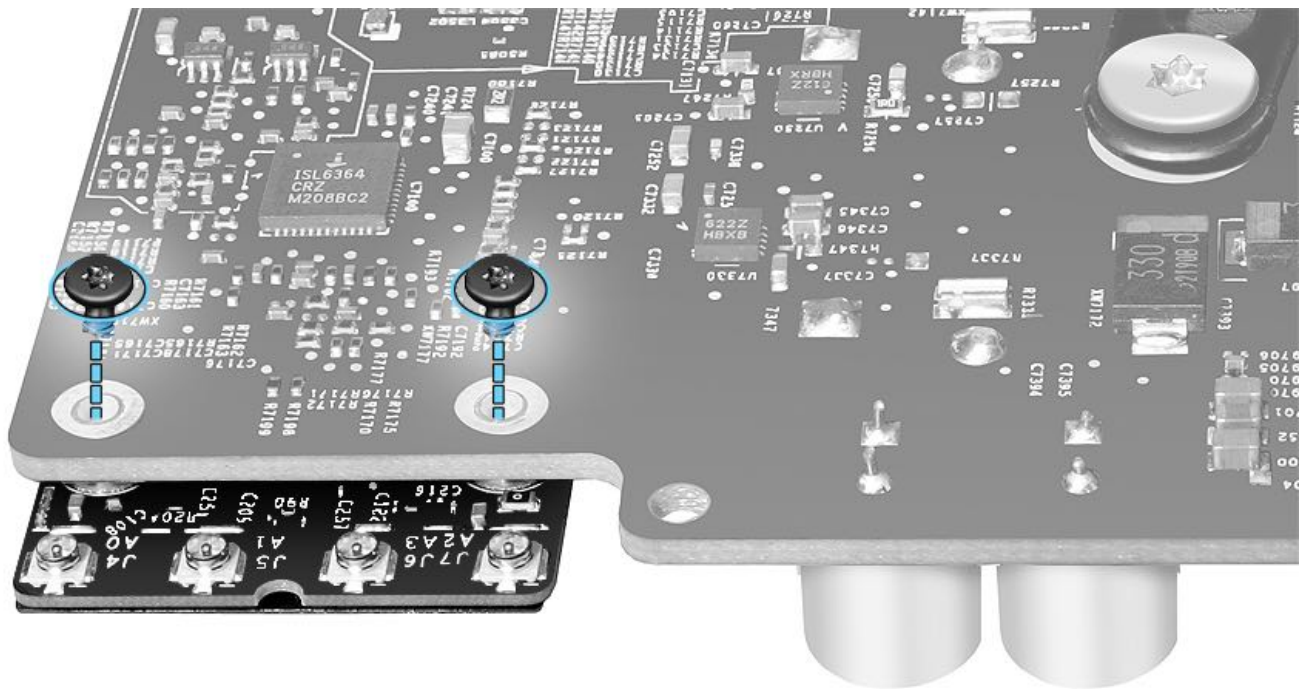
14. Remove Kapton tape covering connectors.



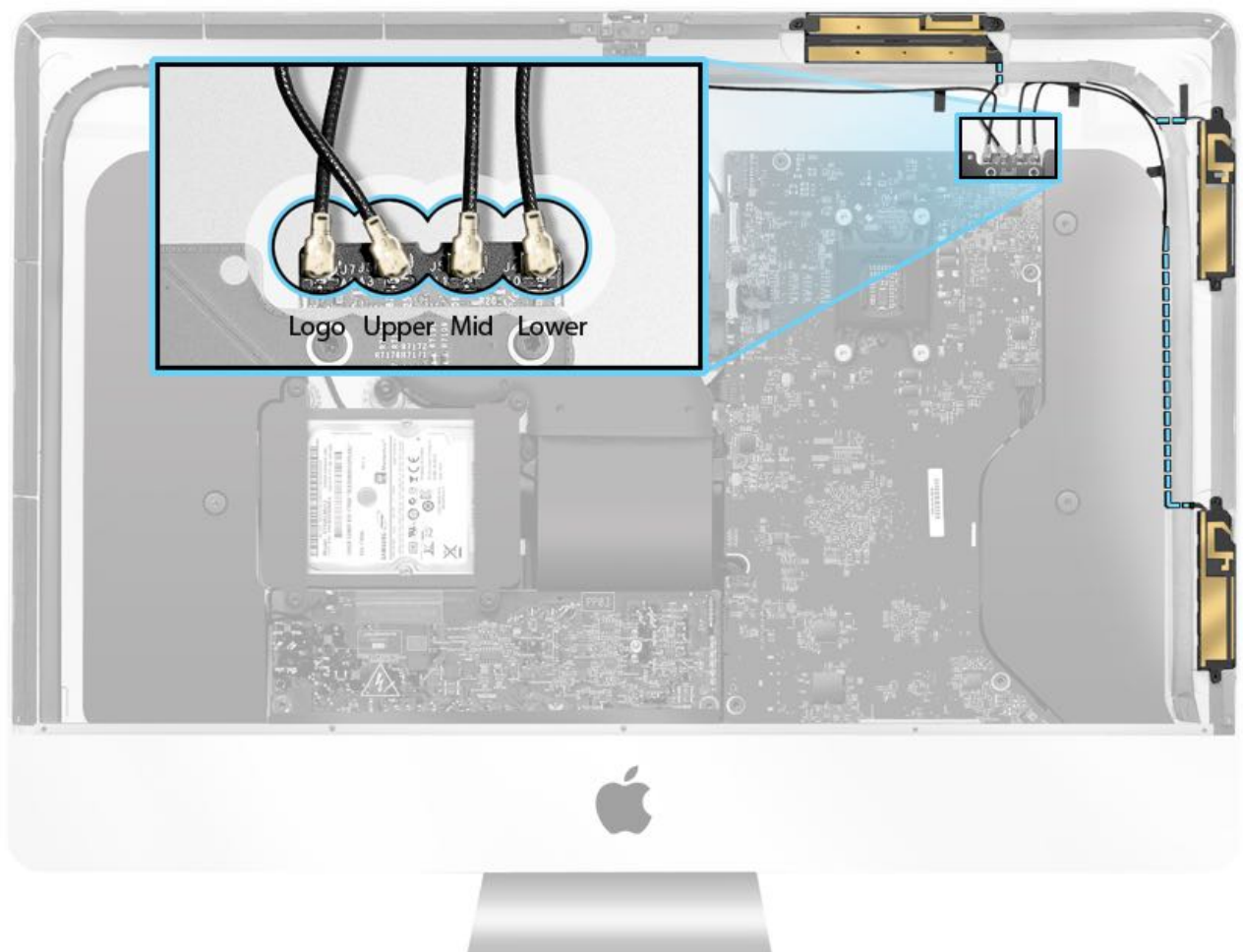
15. Align wireless card and slide into connector on logic board.



16. Replace two (2) T4 screws (923-0330) to logic board.



17. After installing logic board, connect antenna cables using the routing below. The logo antenna is the left-most connector, then continue attaching the antennas clockwise.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Battery

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

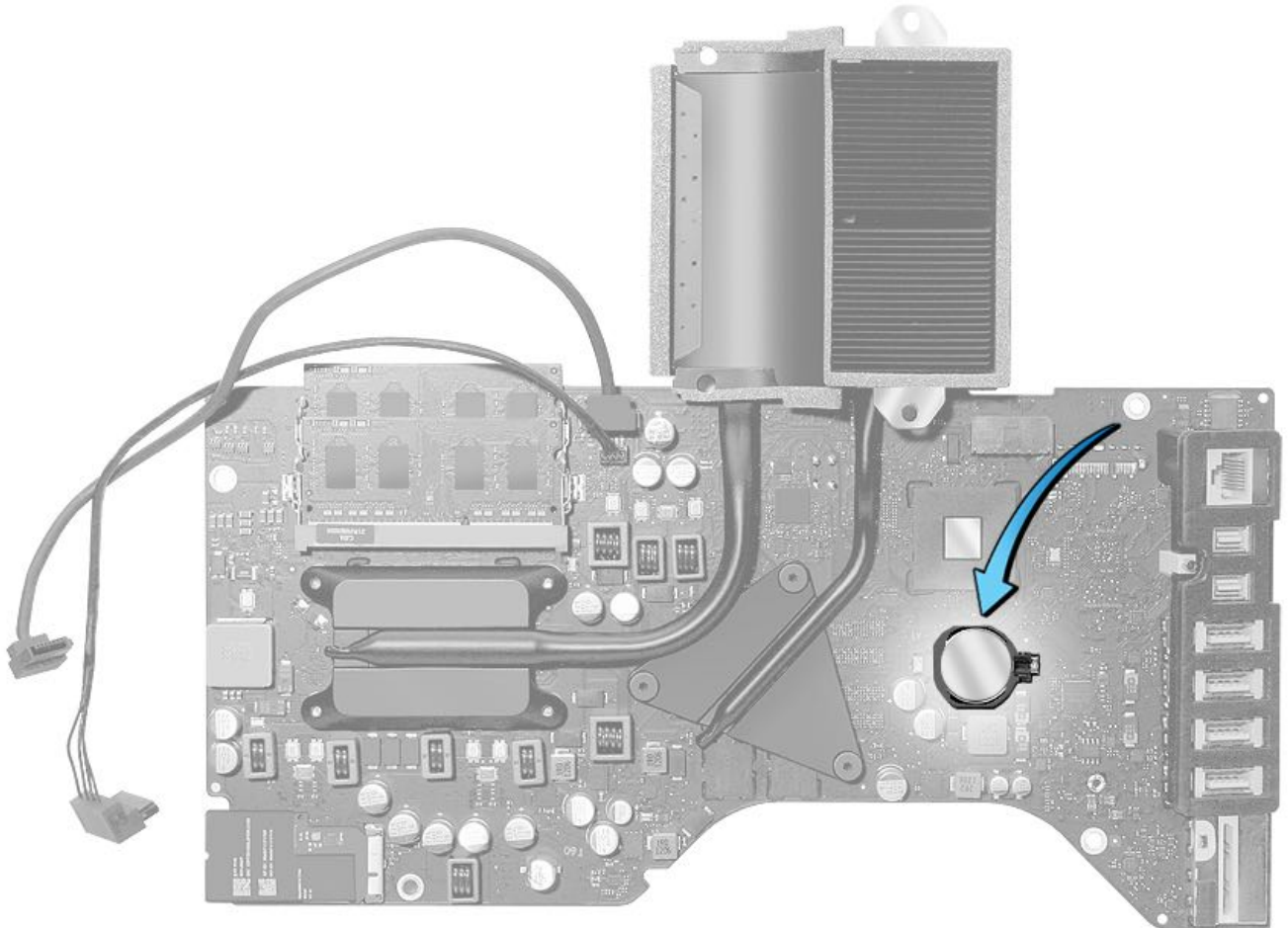
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

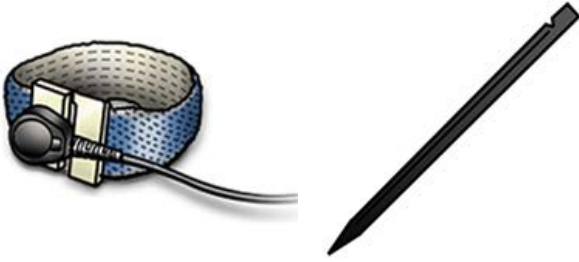
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)
- [Logic Board](#)

Note: The chin strap must be removed for this repair.



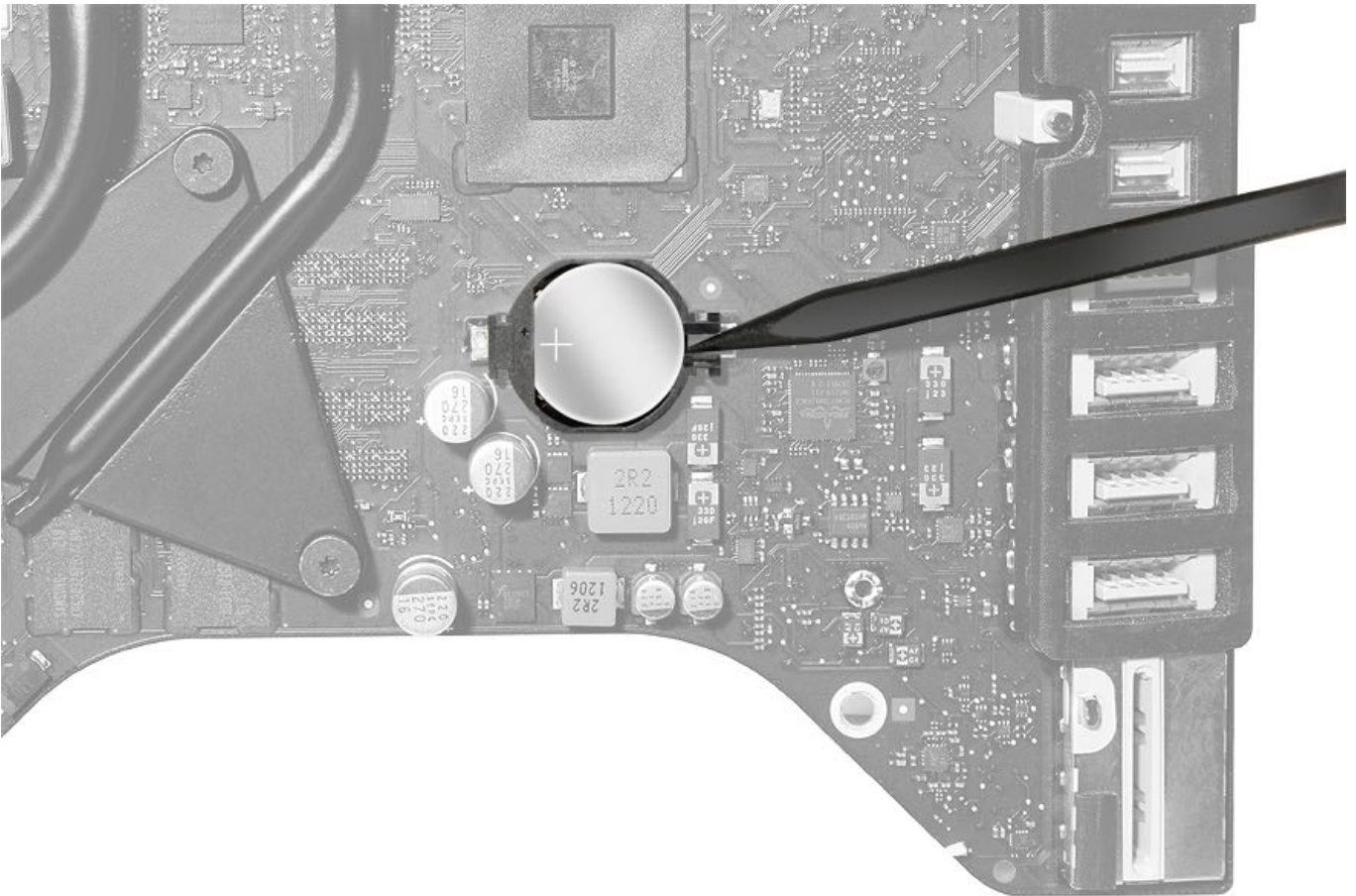
Tools

- ESD mat and wrist strap
- Black stick



Steps For Removal

1. Use a black stick to pry battery from socket on back side of logic board. The battery will spring out of the socket.



Steps For Reassembly

1. Make sure battery socket on back side of logic board is open and free of dust.
2. Press battery into socket with engraved markings (+ side) facing up.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Hard Drive Data Cable and Power Cable

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

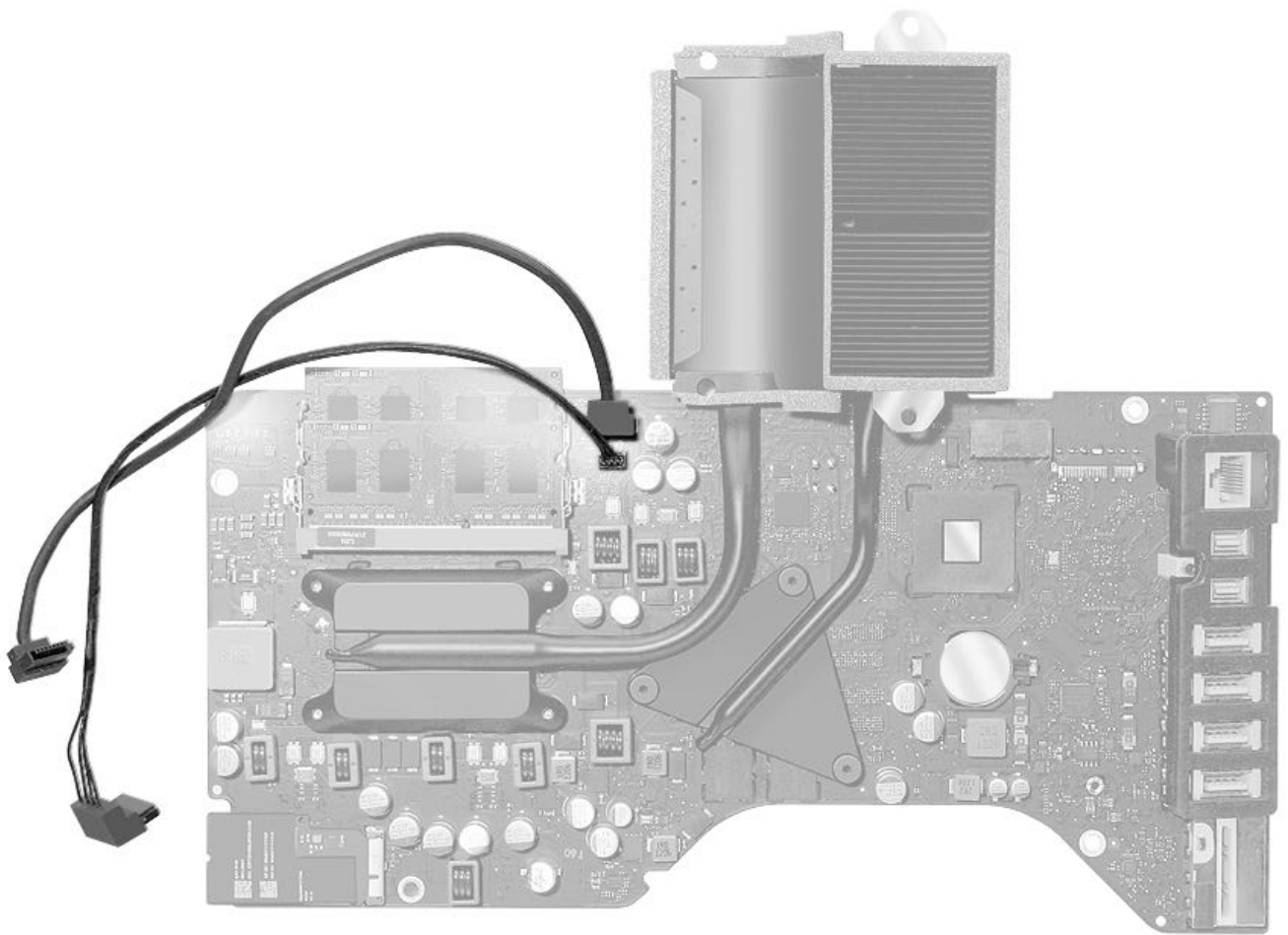
Before you begin:

Remove:

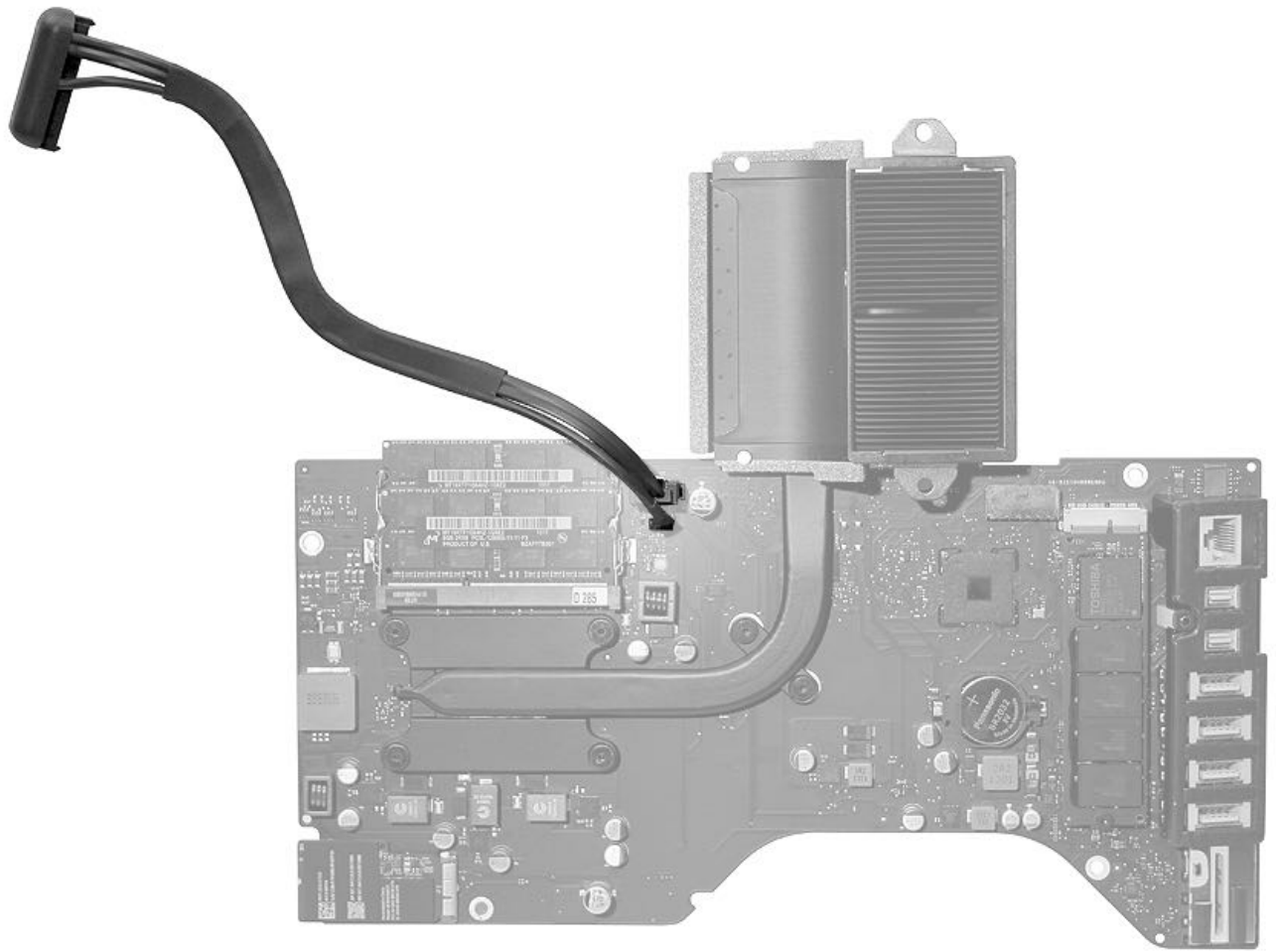
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)
- [Logic Board](#)

Note: The chin strap must be removed for this repair.

iMac (21.5-inch, Late 2012 and Early 2013)

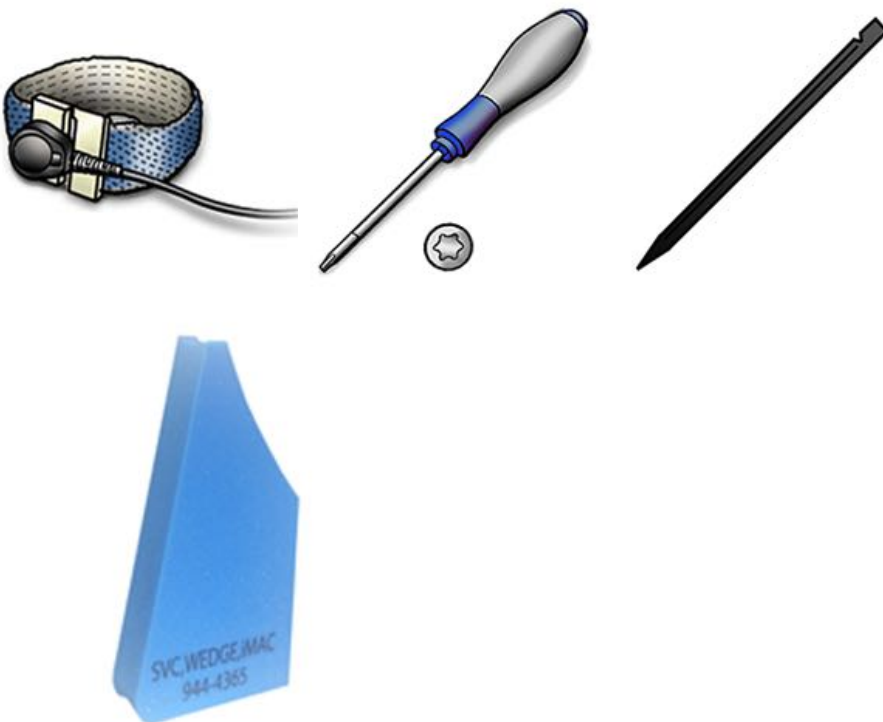


iMac (21.5-inch, Late 2013)



Tools

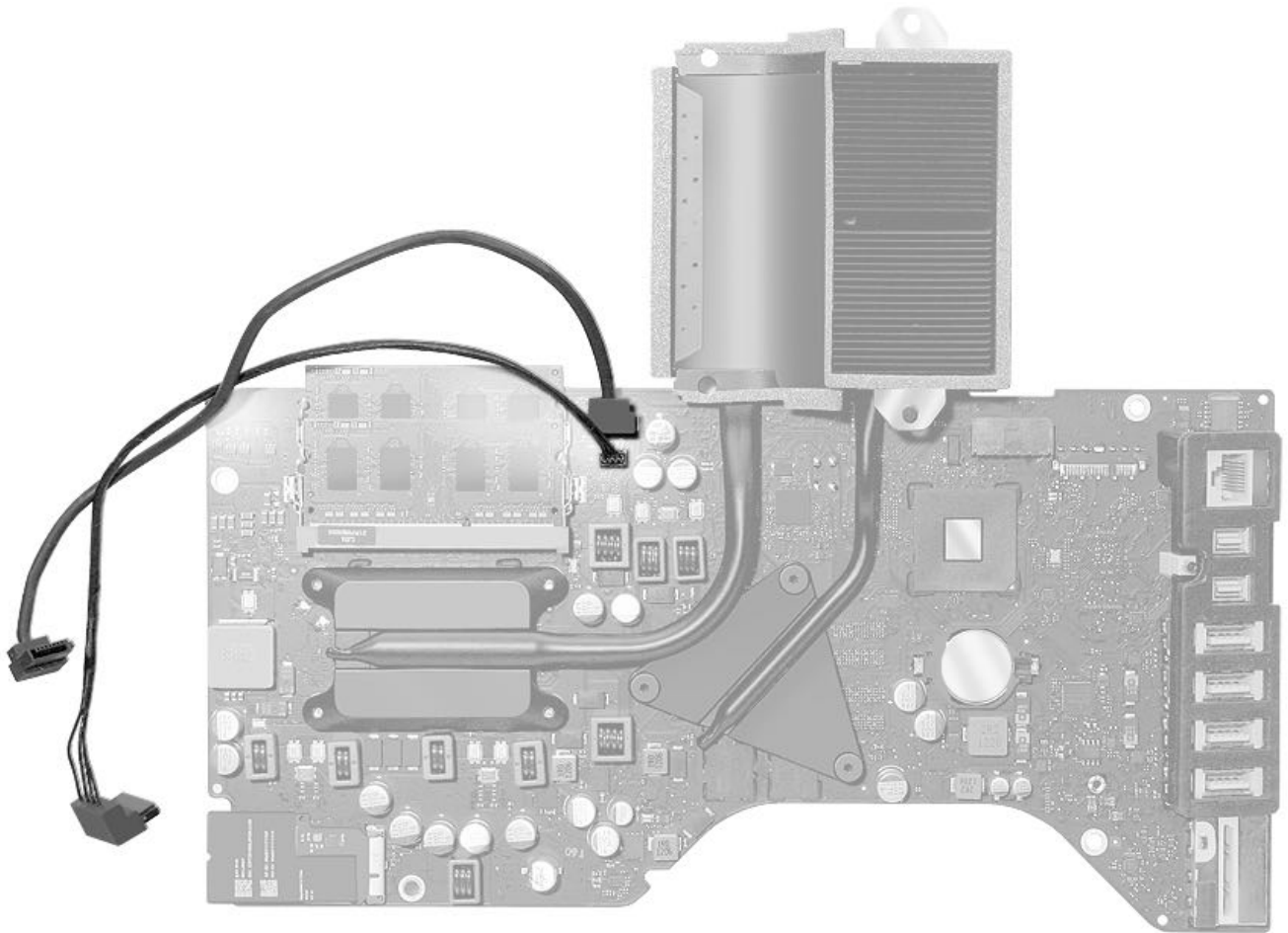
- ESD wrist strap and mat
- Magnetized Torx 8 screwdriver
- Magnetized Torx 10 screwdriver
- Black stick
- Service wedge, iMac



Steps For Removal

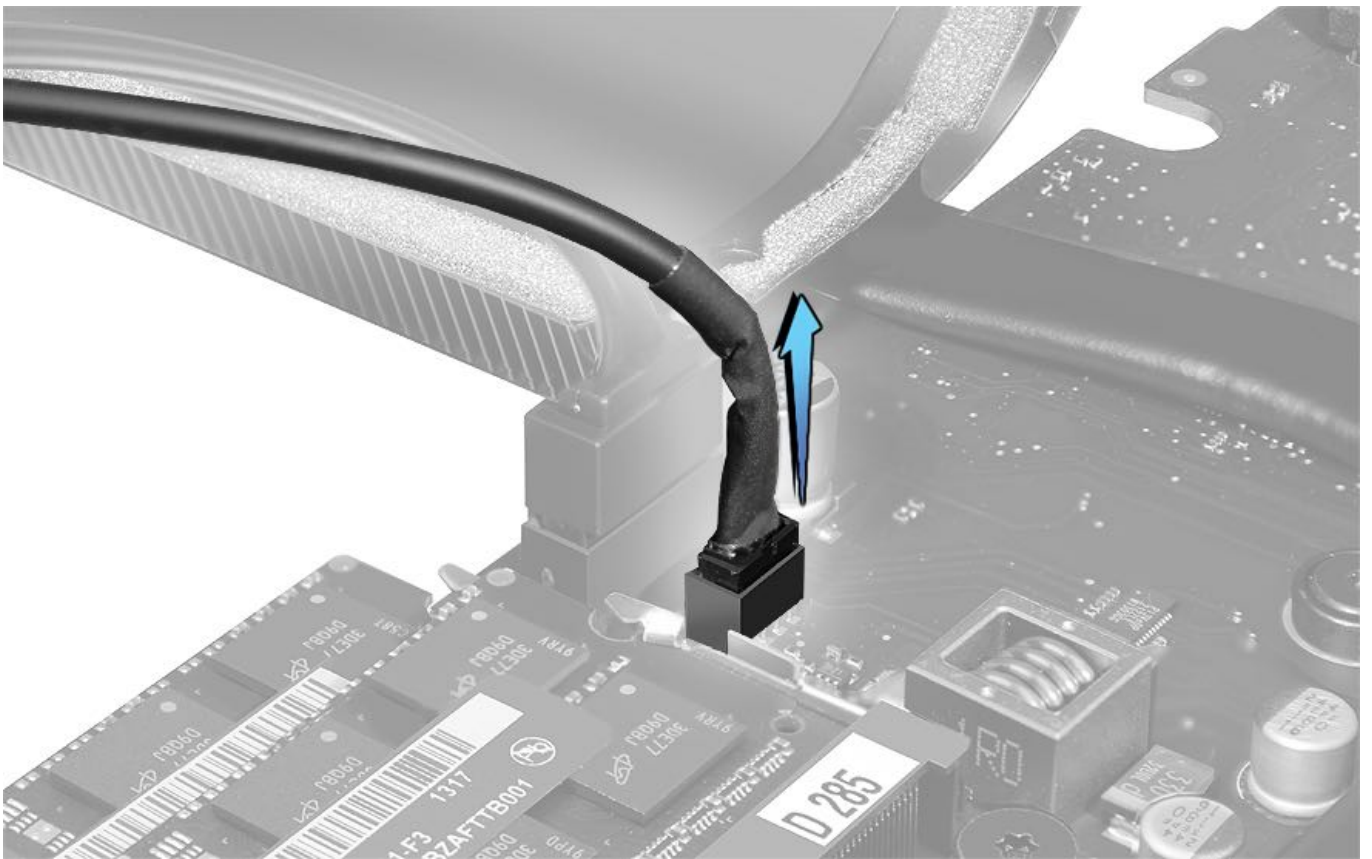
iMac (21.5-inch, Late 2012 and Early 2013)

1. Disconnect hard drive data cable and hard drive power cable from the back side of the logic board.



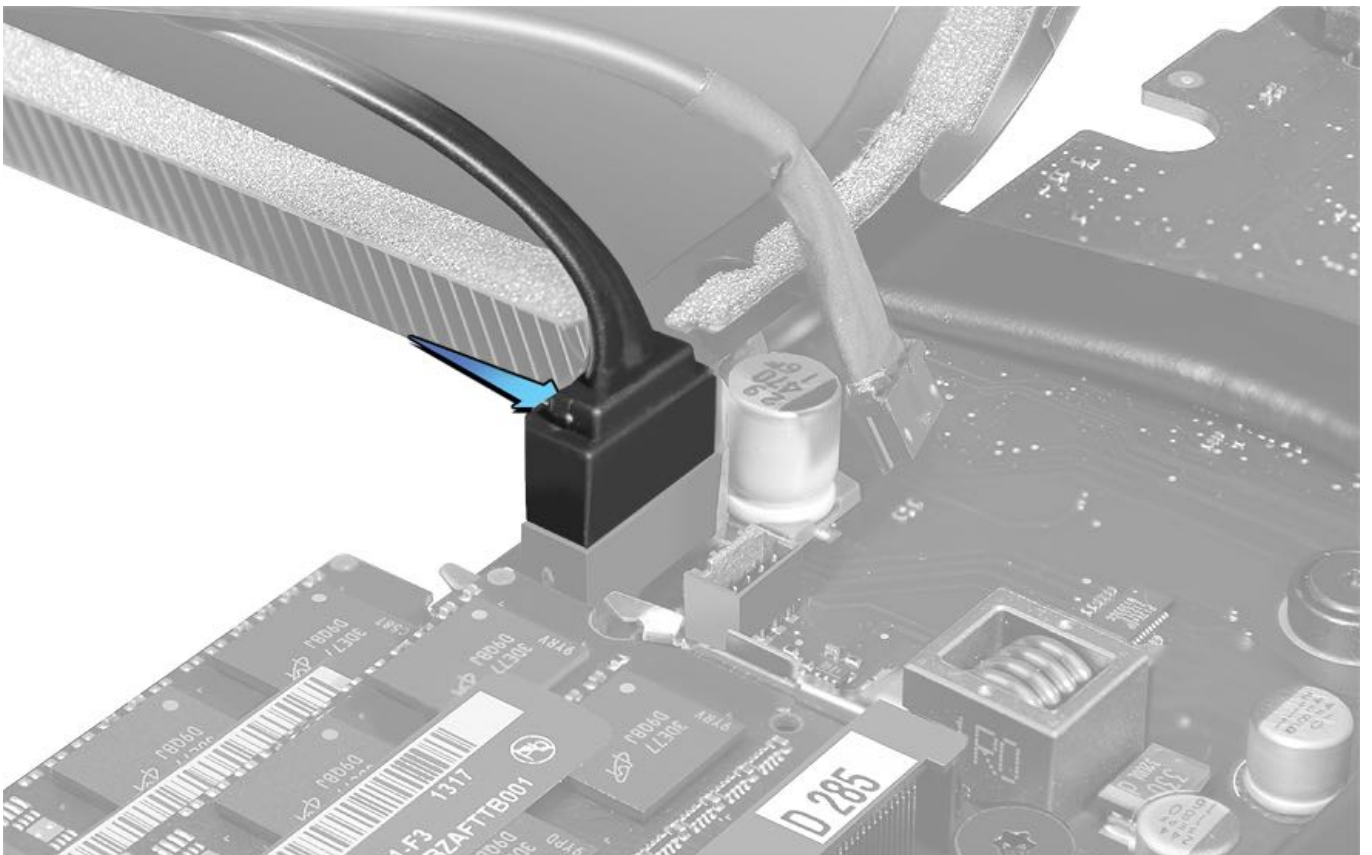
iMac (21.5-inch, Late 2013)

2. Pull hard drive power cable straight up and out of connector.



iMac (21.5-inch, Late 2013)

3. Pinch clip on back side of hard drive data cable, then pull straight up. See clip in next image.



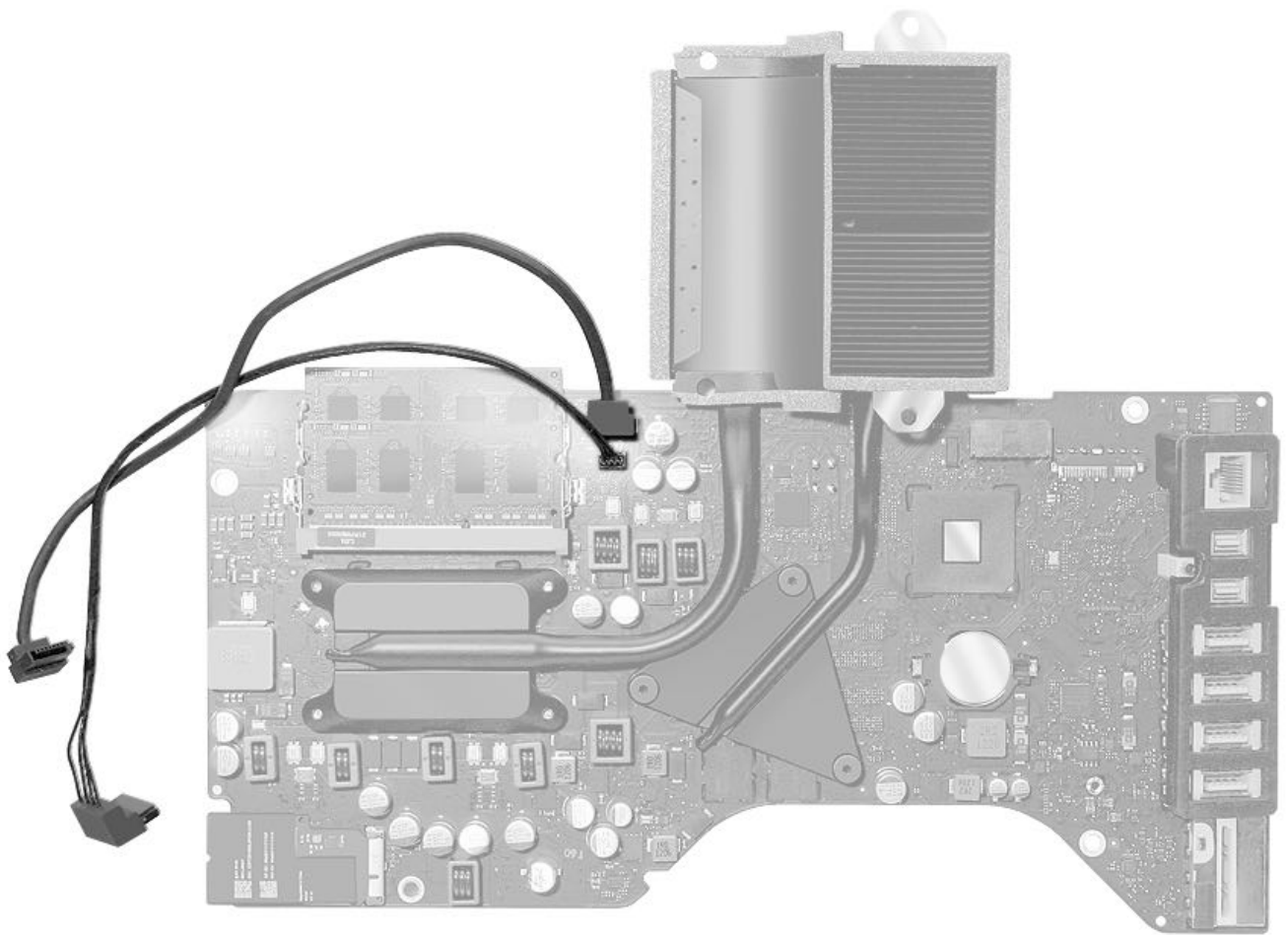
Hard drive data cable clip shown from another angle. Press the clip to release hard drive data cable connector.



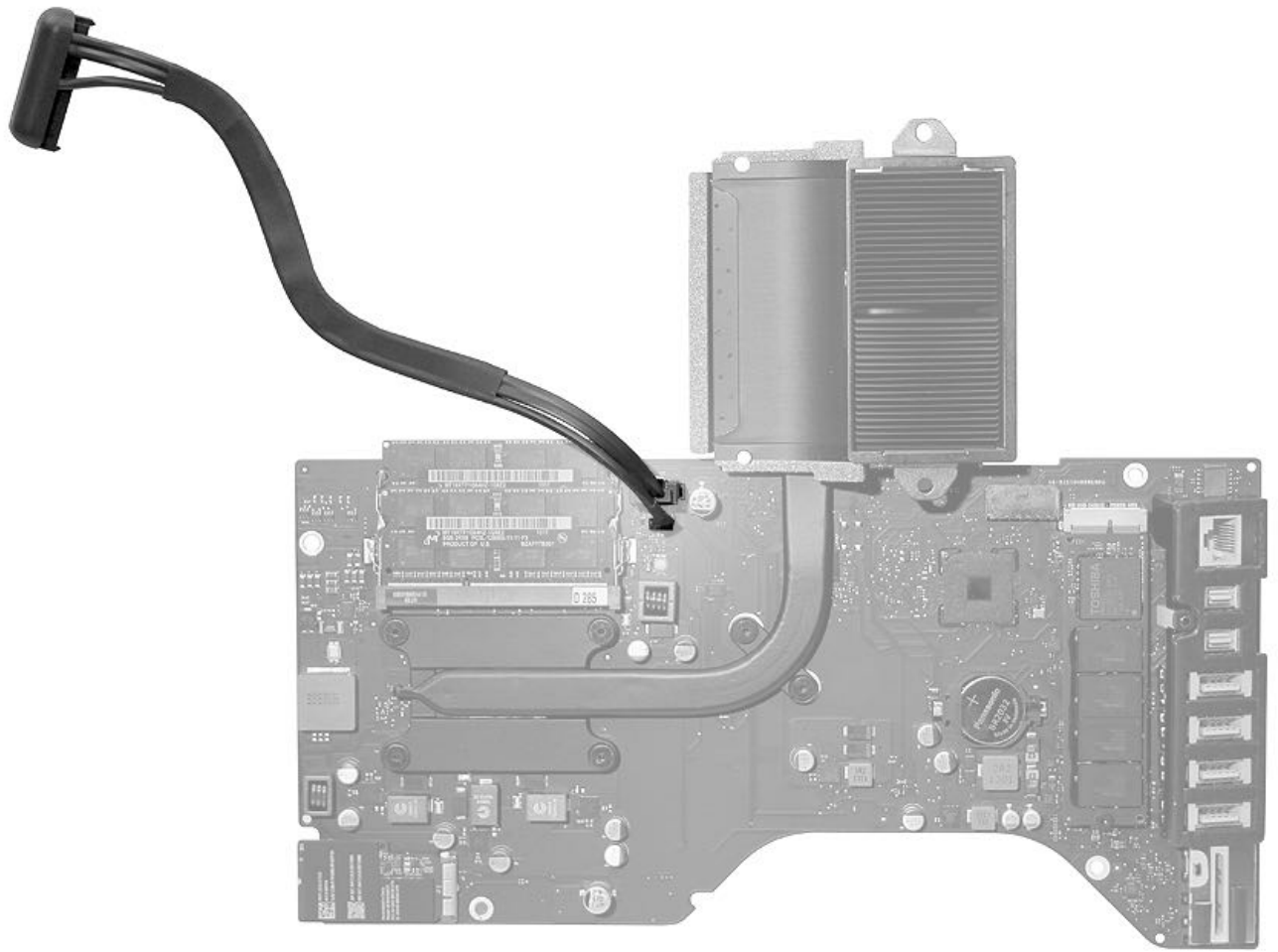
Steps For Reassembly

iMac (21.5-inch, Late 2012 and Early 2013)

1. Connect hard drive data cable and hard drive power cable onto their connectors on back side of logic board.

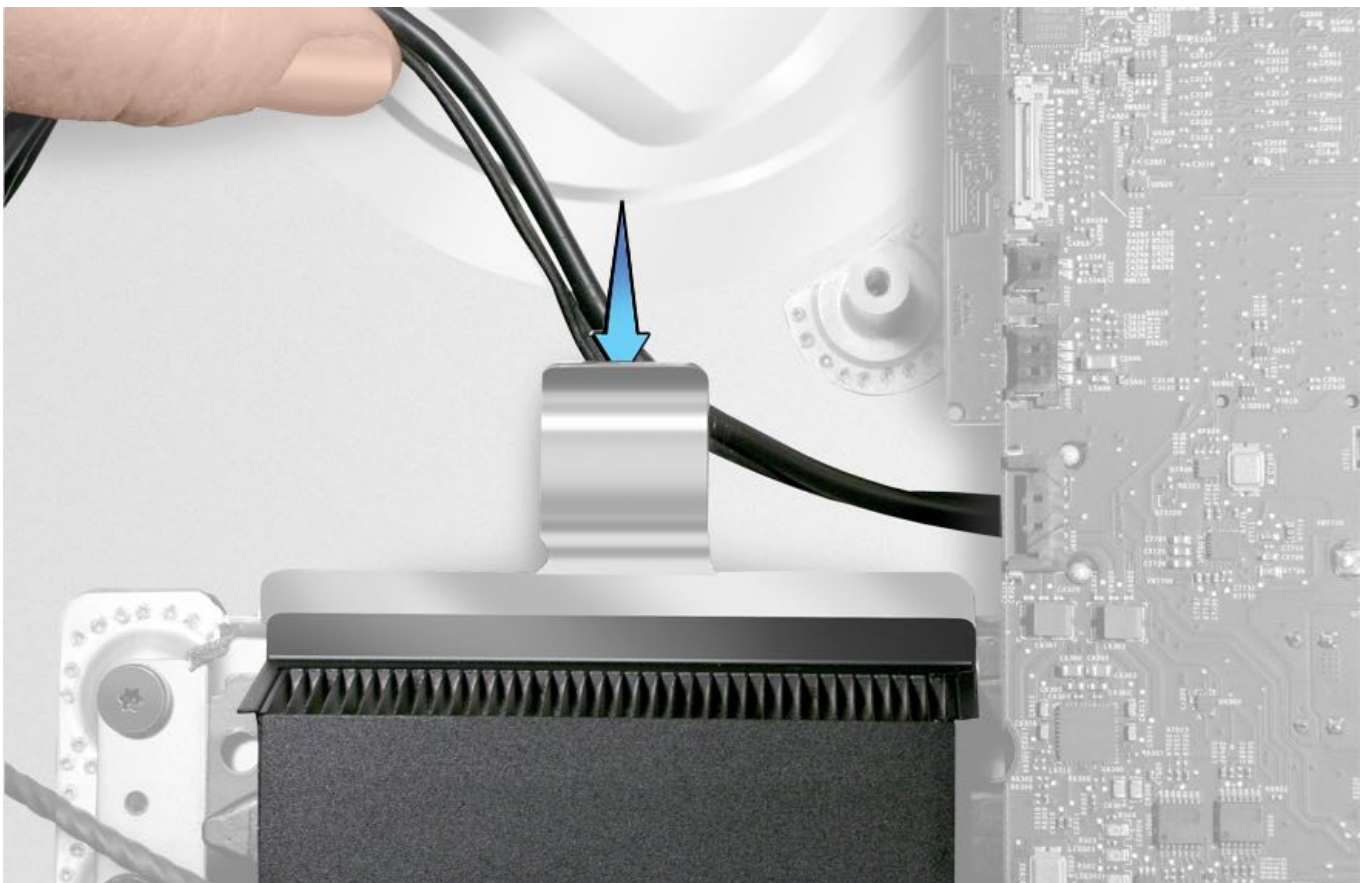


iMac (21.5-inch, Late 2013)



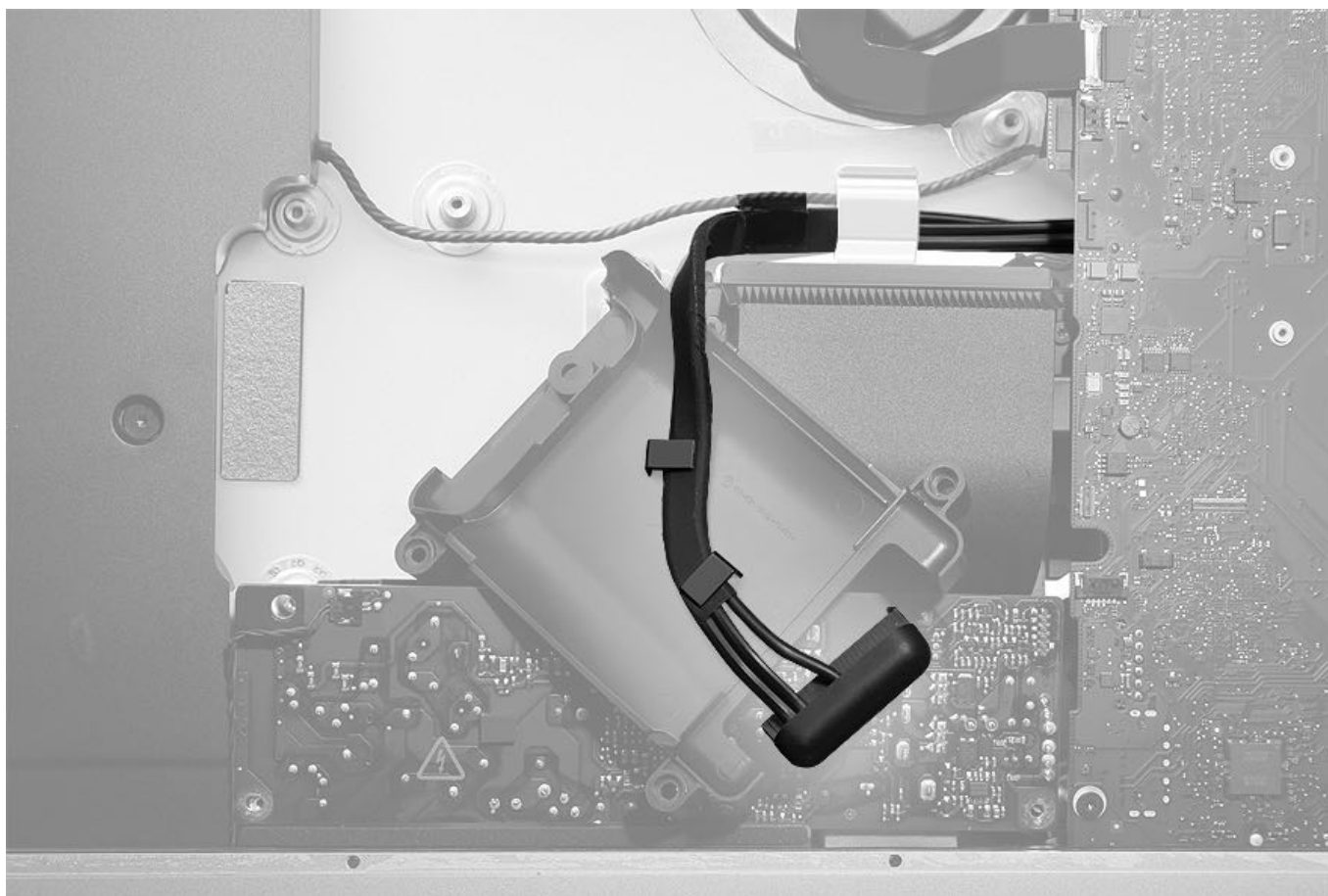
iMac (21.5-inch, Late 2012 and Early 2013)

2. After installing logic board, route hard drive data cable and hard drive power cable through rear housing clip.



iMac (21.5-inch, Late 2013)

Route the combo cable under the rear housing clip.



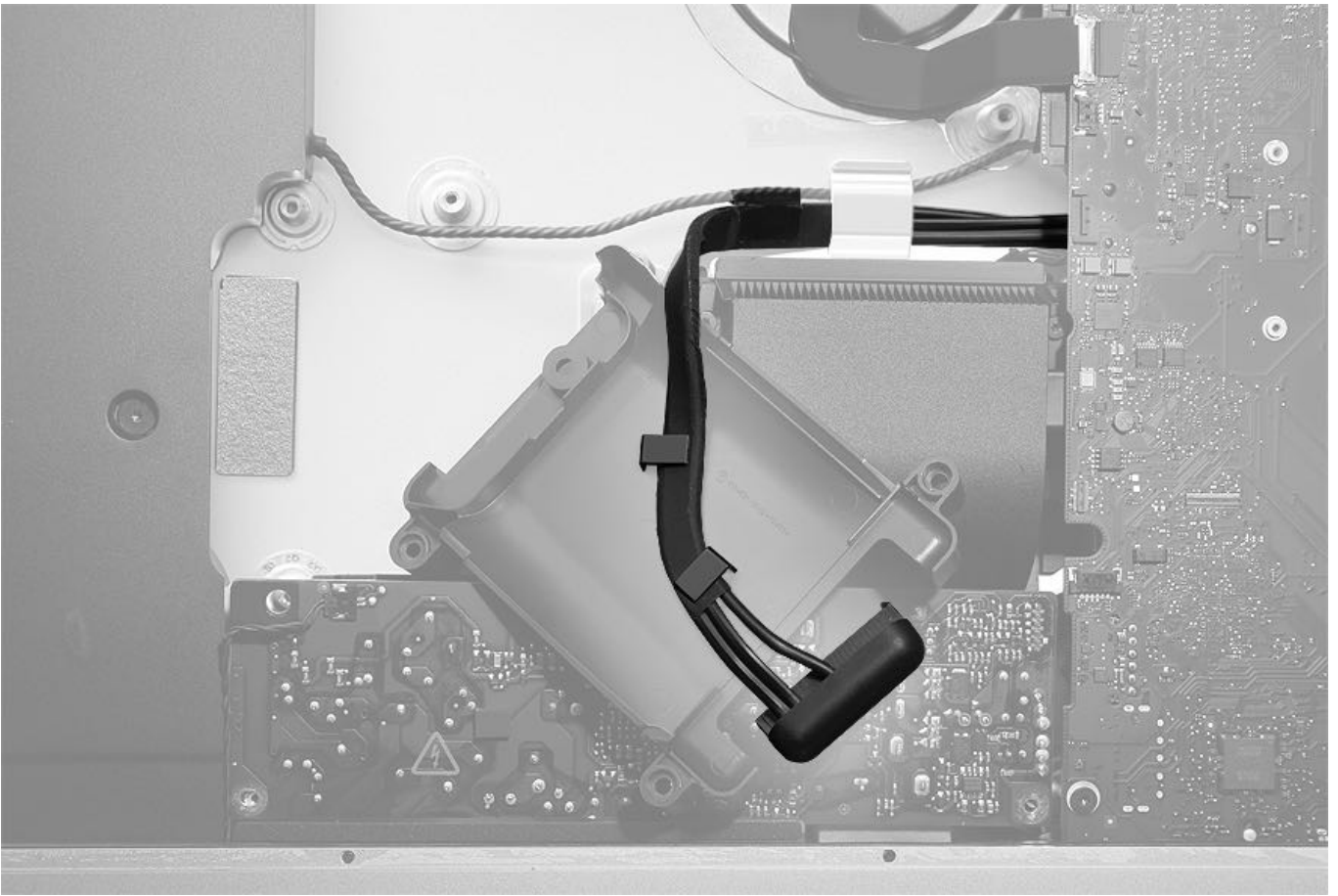
iMac (21.5-inch, Late 2012 and Early 2013)

3. Route hard drive data cable and hard drive power cable underneath hard drive cradle as shown.



iMac (21.5-inch, Late 2013)

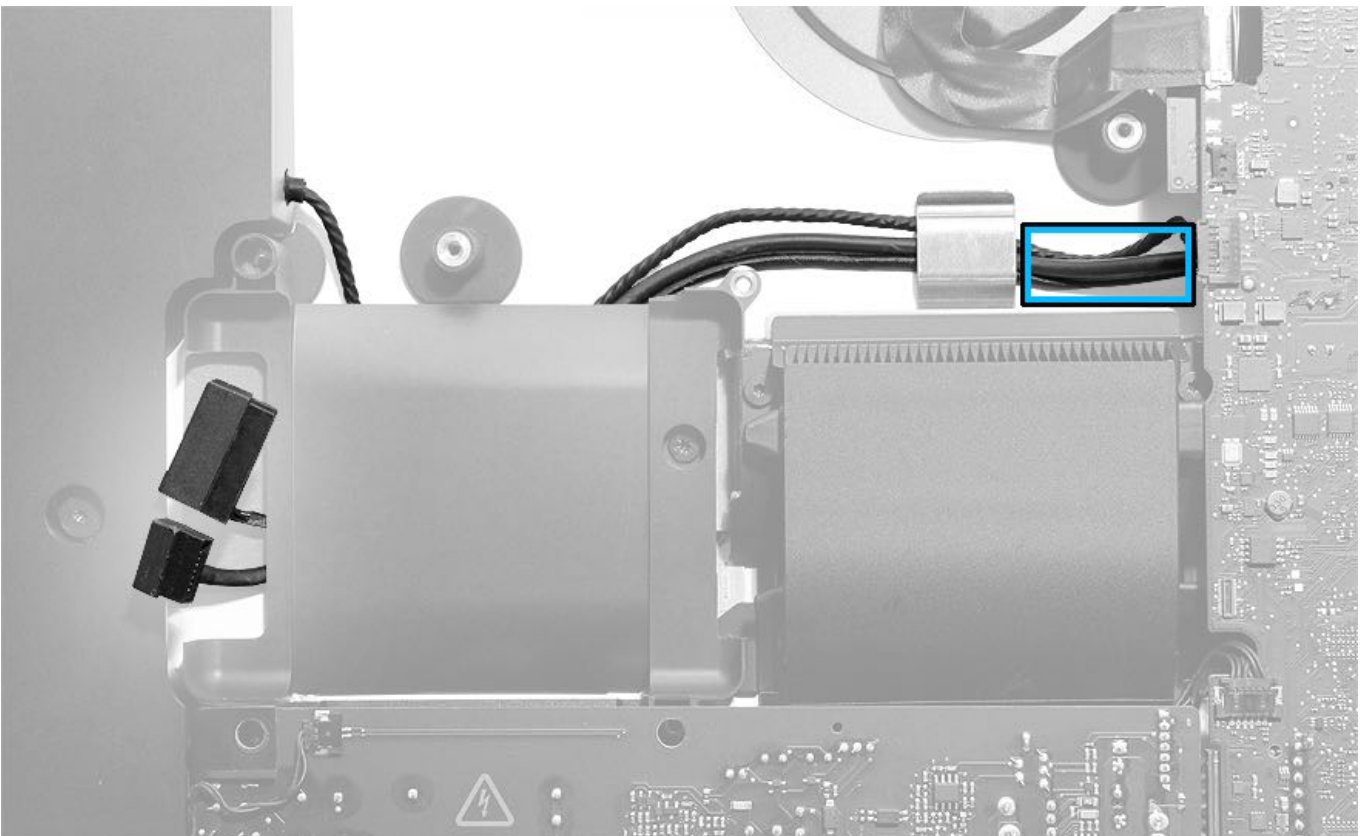
Route the combo cable underneath hard drive cradle clips.



iMac (21.5-inch, Late 2012 and Early 2013)

4. Leave some slack on the hard drive data cable (indicated by blue box) that connects to the logic board connector.

Caution: Be careful not to pinch the cables under the hard drive cradle.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Power Supply

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

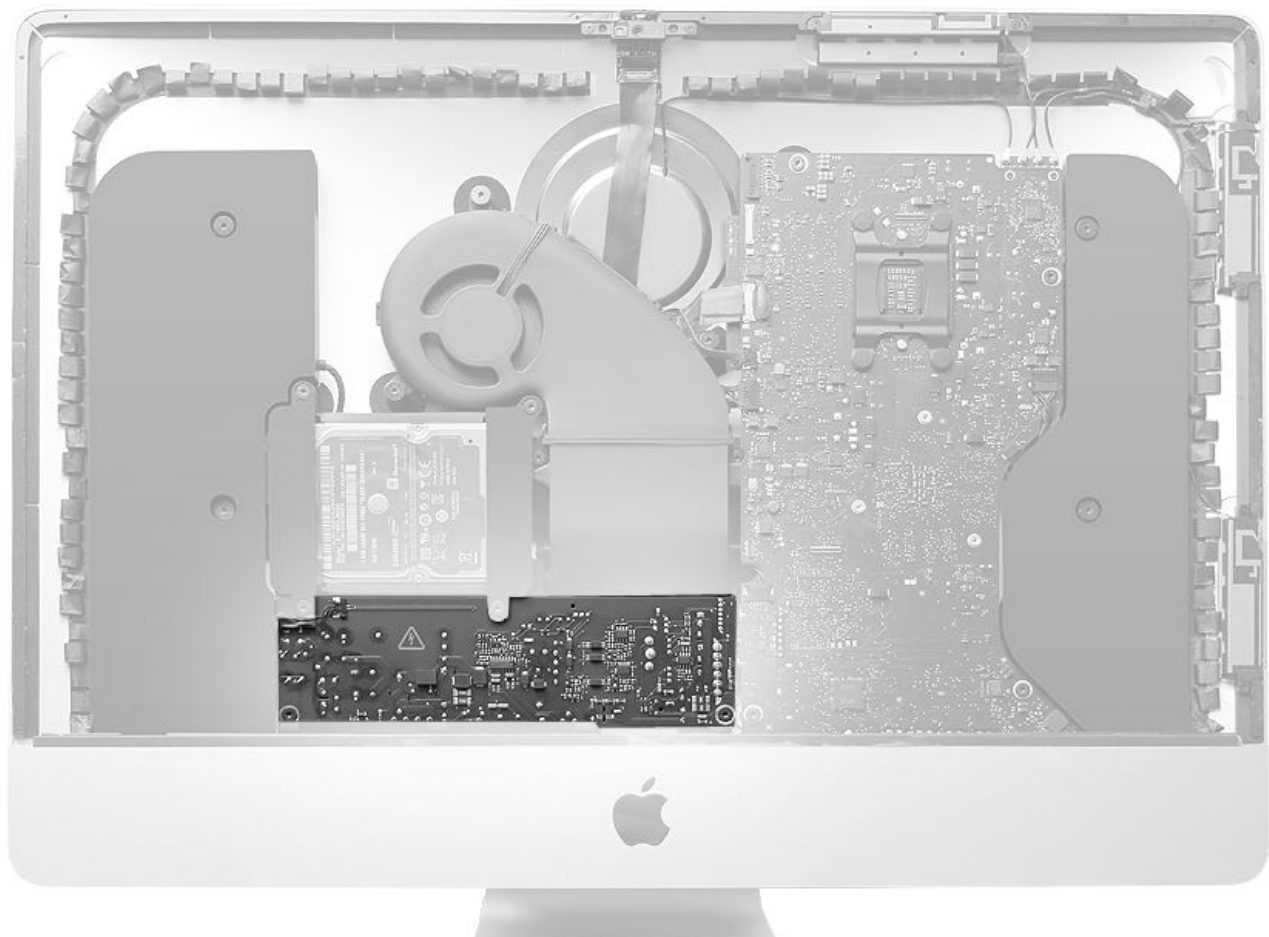
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

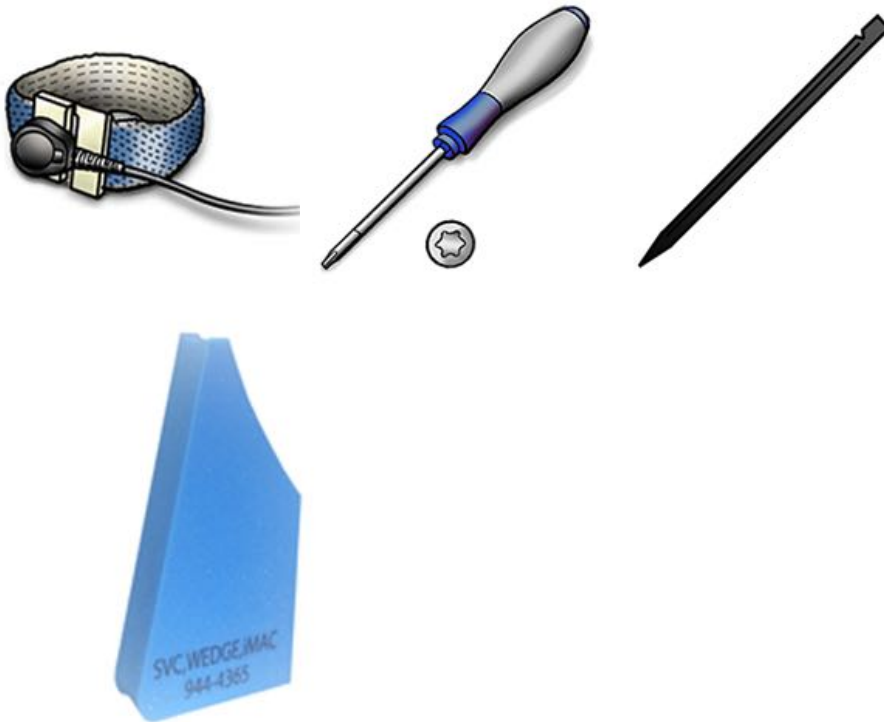
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Left Speaker](#)
- [Logic Board](#)

Note: The chin strap must be removed for this repair.



Tools

- ESD wrist strap and mat
- Magnetized Torx 10 screwdriver
- Black stick
- Service wedge, iMac



Steps For Removal



High Voltage Warning: Use extreme caution when troubleshooting with the display panel removed. Avoid touching the logic board or power supply while the computer is plugged in because the power supply retains a charge whether or not the computer is on. Before working on or near the power supply, unplug the power cord from the computer and wait at least two minutes for the electricity to discharge.

- Never remove or install any physical components while the computer is plugged in to an electrical outlet.
- When plugged in, the power supply and logic board are energized, even when the computer is powered off.
- Unplug computer and, when possible, allow sufficient time for the power supply and logic board to self-discharge before removing display panel.
- Do NOT touch the logic board or power supply while the computer is plugged in, or before sufficient time has passed to discharge stored voltage to a safe level after being unplugged.

Warning: After unplugging the computer from the electrical outlet, wait **two** minutes before removing display panel, disconnecting modules or substituting cables and components. This will allow the power supply and logic board time to discharge.

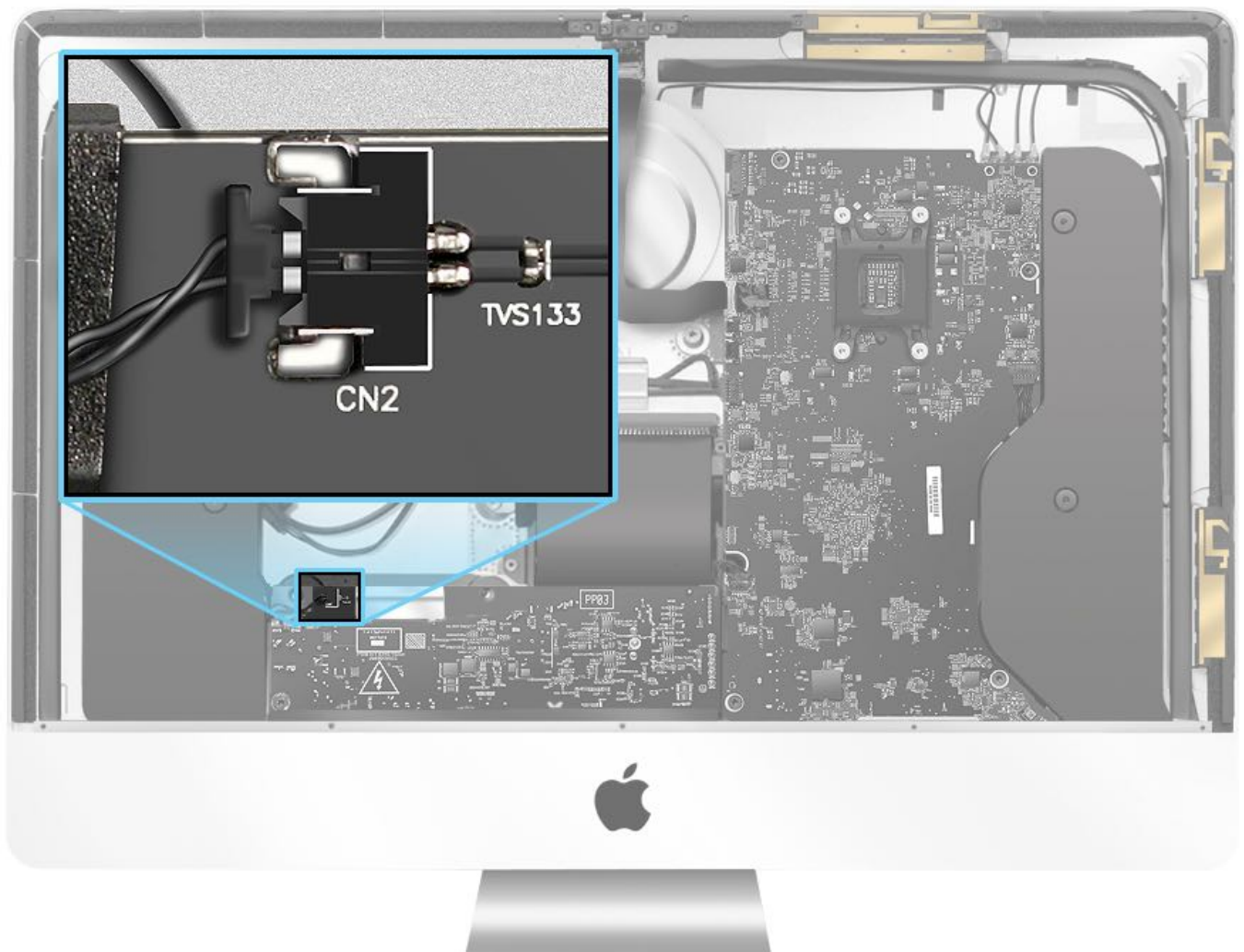
Electrical Safety Precautions

Before working on a computer with exposed, potentially energized parts:

1. **Remove rings, watches, necklaces, metal-rimmed eyewear, and other metallic articles** which increase your risk of electric shock.
2. **Do not wear a cell phone or other signaling device**, as these may cause a dangerous startle reflex during energized work.
3. **If the iMac needs to be plugged in for LED checks or similar troubleshooting, do NOT wear an ESD wrist strap.** Wearing ESD grounding systems increases your risk of electric shock.
4. **Remain alert**, focused on the work being performed, and aware of the proximity of grounded objects to your body.

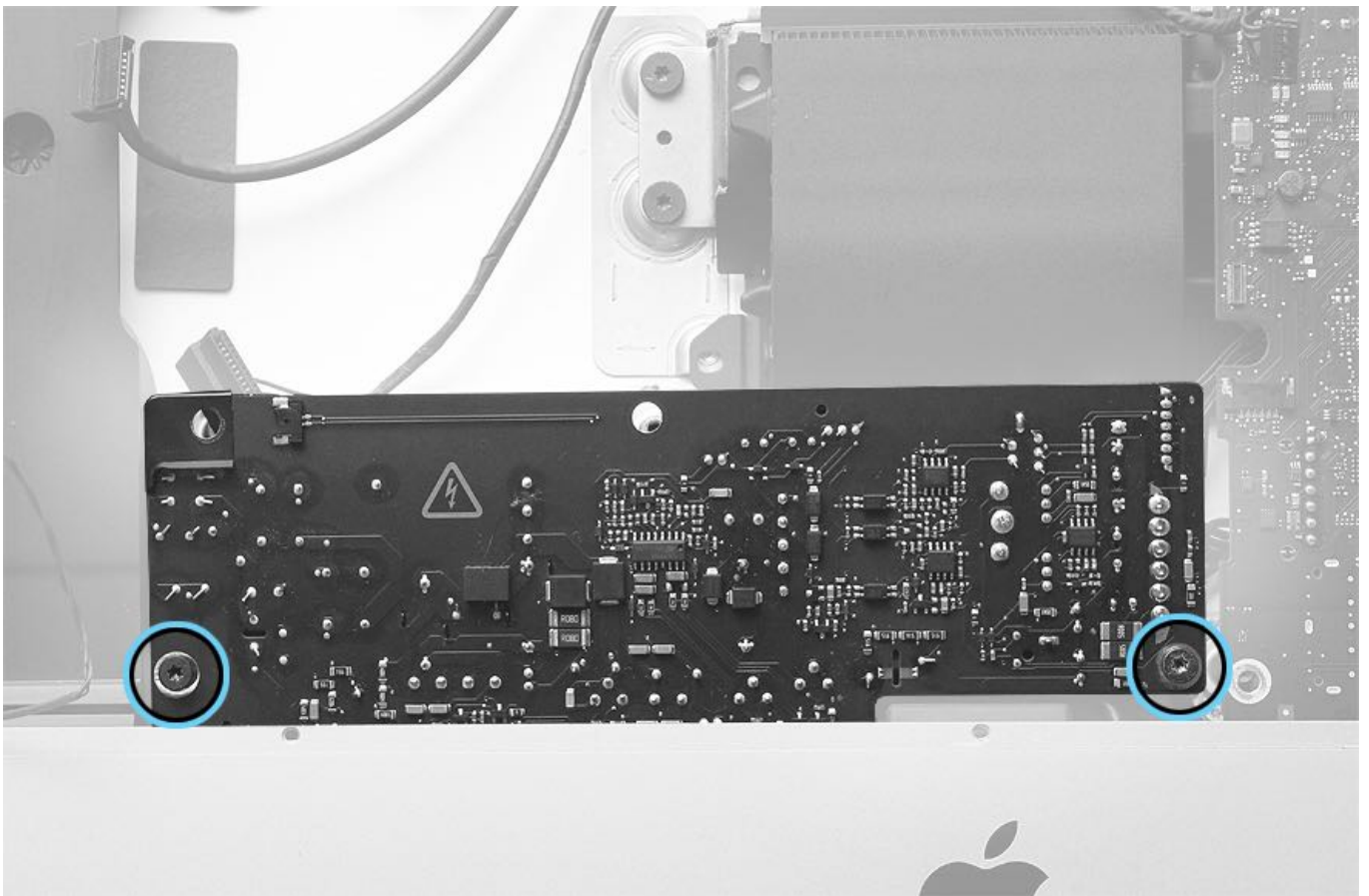
5. **Use the plastic black stick or other non-metal extension tool as needed** to connect or disconnect cables, to keep fingers away from potentially energized parts.

1. Carefully disconnect power button cable from top left corner of power supply. **Note:** If the power button cable breaks, the rear housing will need to be replaced. The power button cable is not available separately.

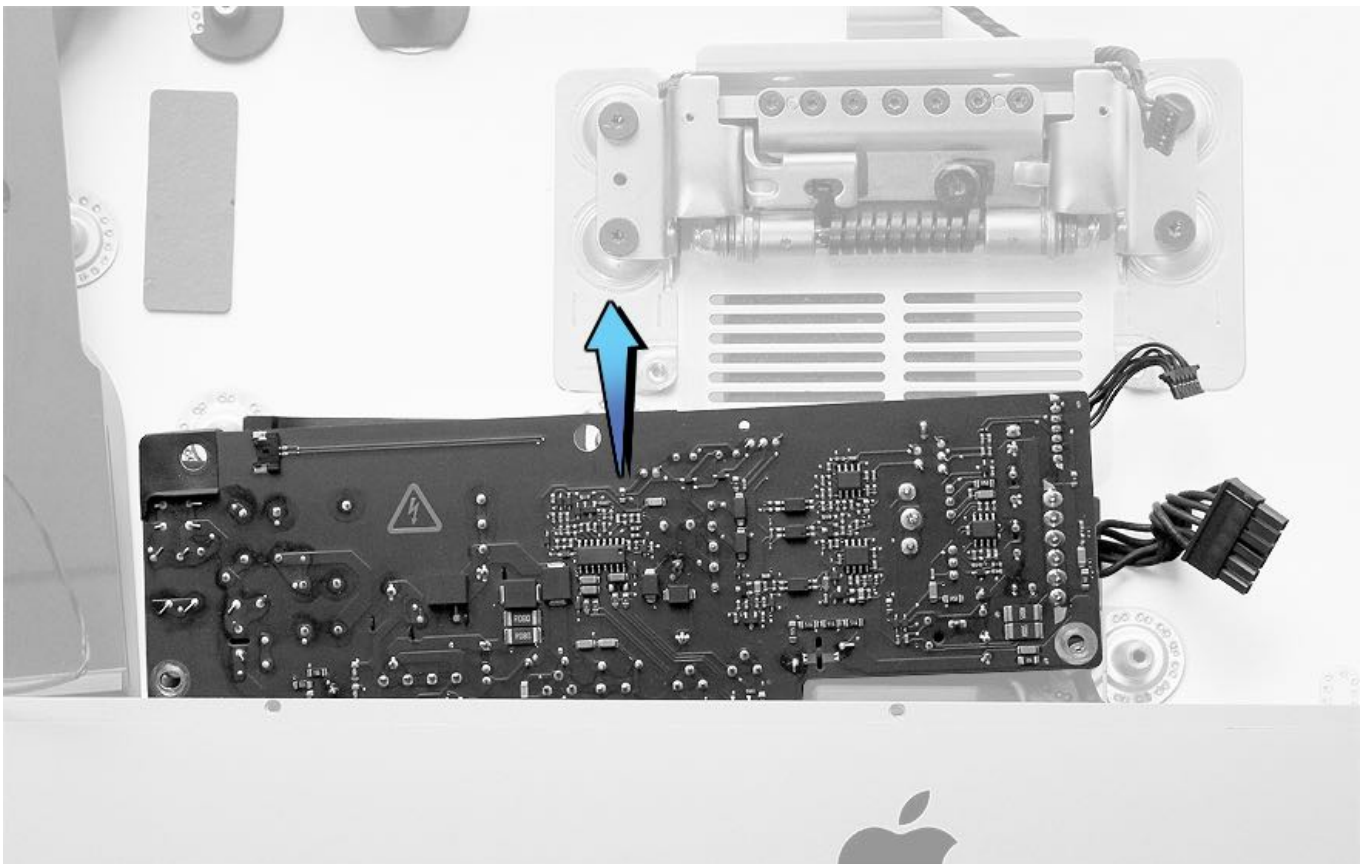


2. Remove two (2) 9.9mm T10 screws (923-0332) from the power supply.

Note: Some repairs require that the power supply screws be loosened but not removed. In those cases, loosen the two (2) screws enough to allow the power supply to be tipped forward and lift the hard drive cradle over the screw bosses.

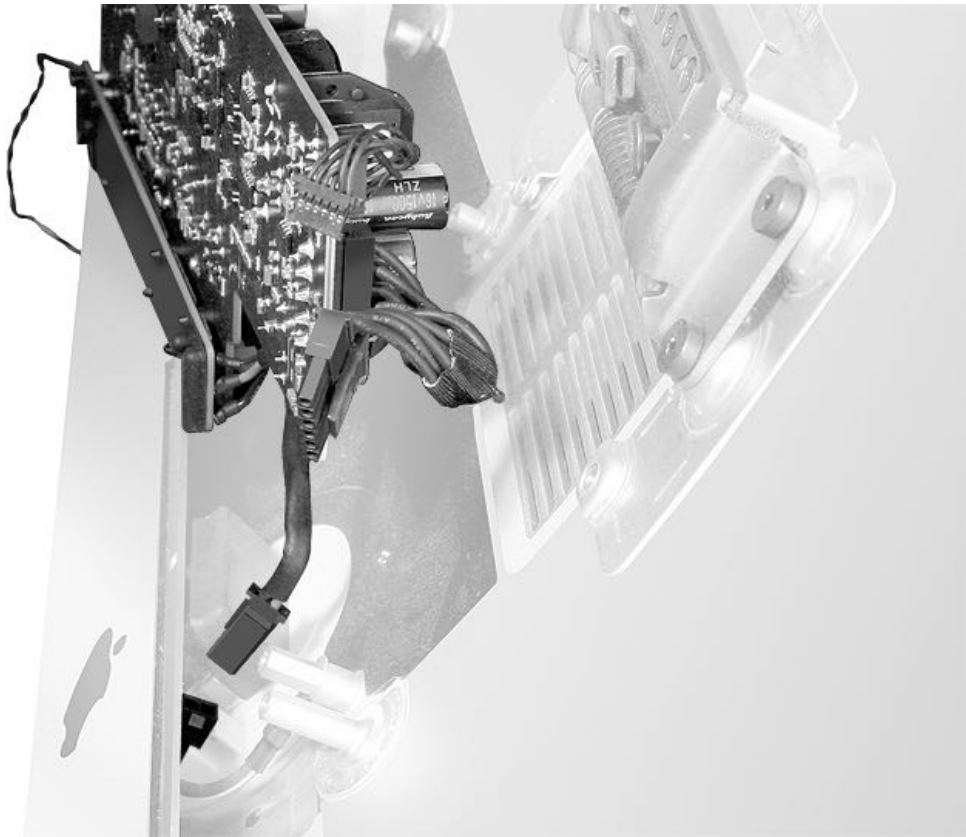


3. Slide power supply out of the chin as far as the AC filter cable will allow.



4. Disconnect AC filter cable from rear housing.

5. Lift the power supply up and out of the chin well.



Steps For Reassembly

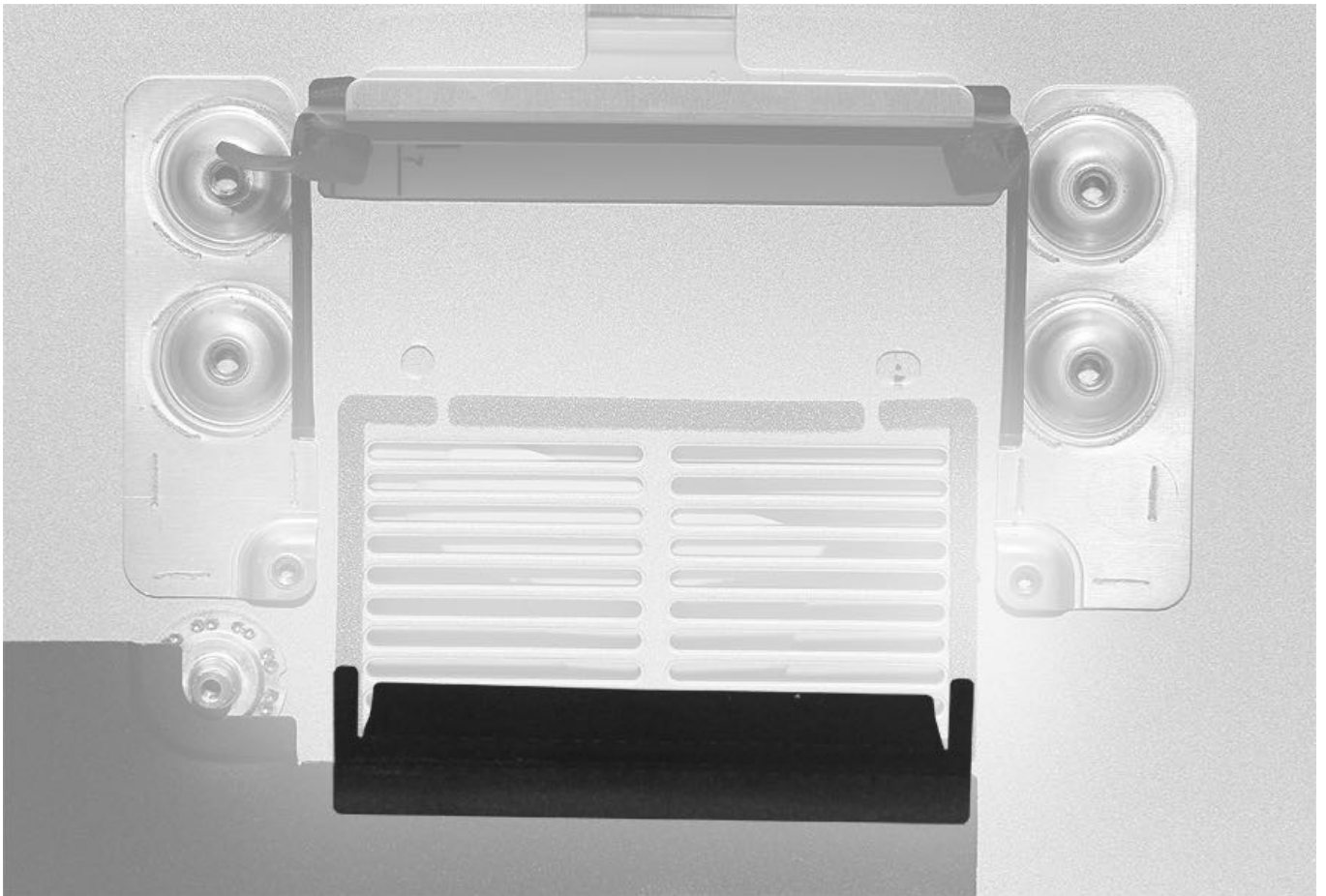
iMac (21.5-inch, Late 2012 and Early 2013)

Important: Before installing the replacement power supply, a power cable guide must be installed. The power cable guide protects the power cable from shorting against the power supply.

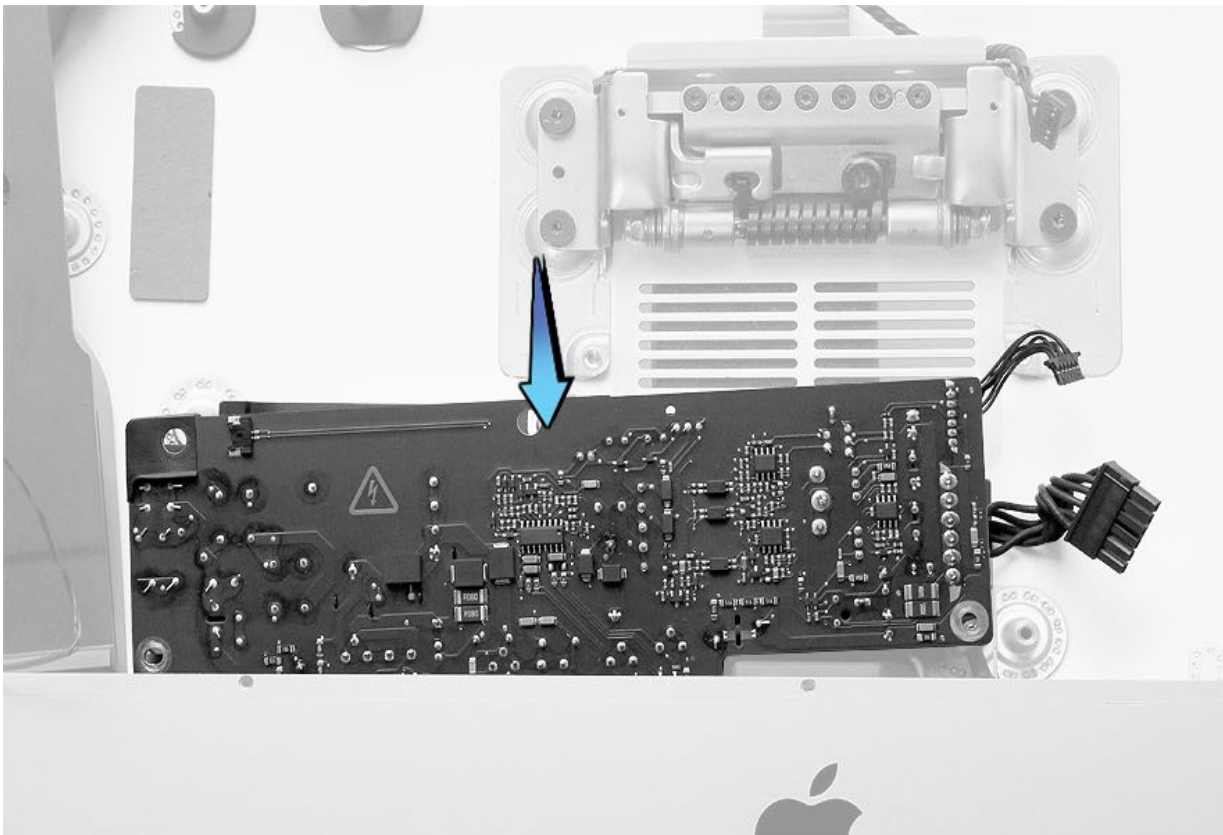
- Find the replacement power cable guide (070-3065) in the replacement power supply box.
- Peel the paper liner off the back of the power cable guide.
- Install power cable guide to the upper left hand corner of the power supply.
- Take care to align the hole carefully so the hard drive bracket can be screwed down correctly.

iMac (21.5-inch, Late 2013)

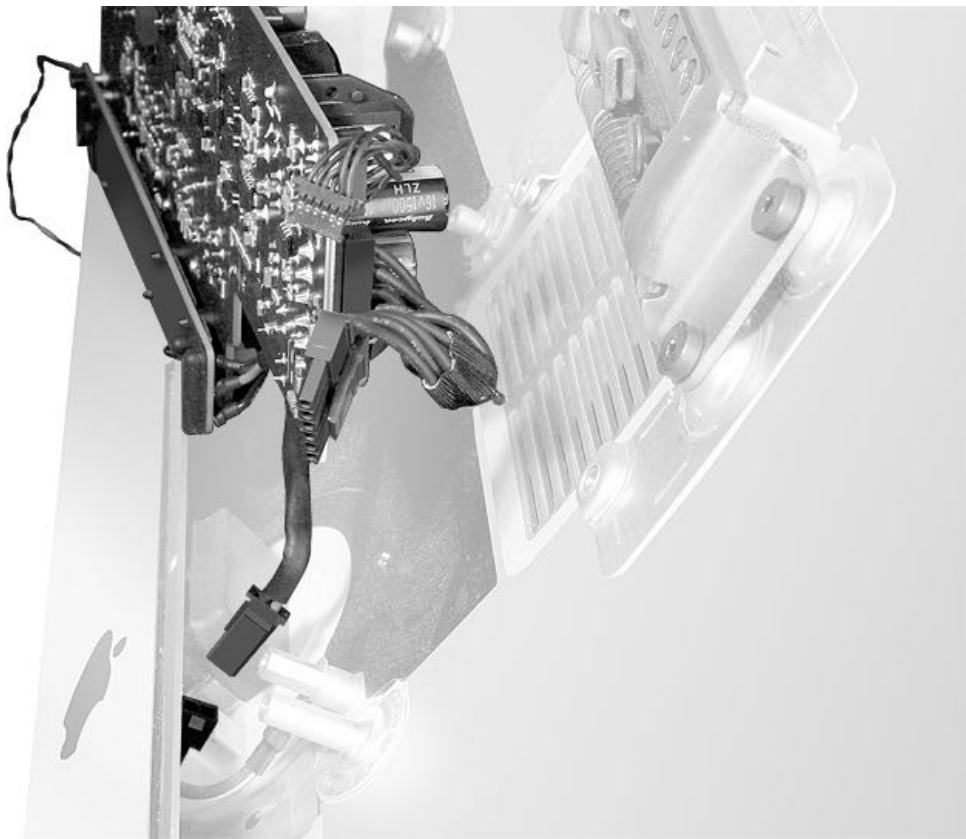
Ensure that the insulator is attached to the rear housing before replacing the power supply.



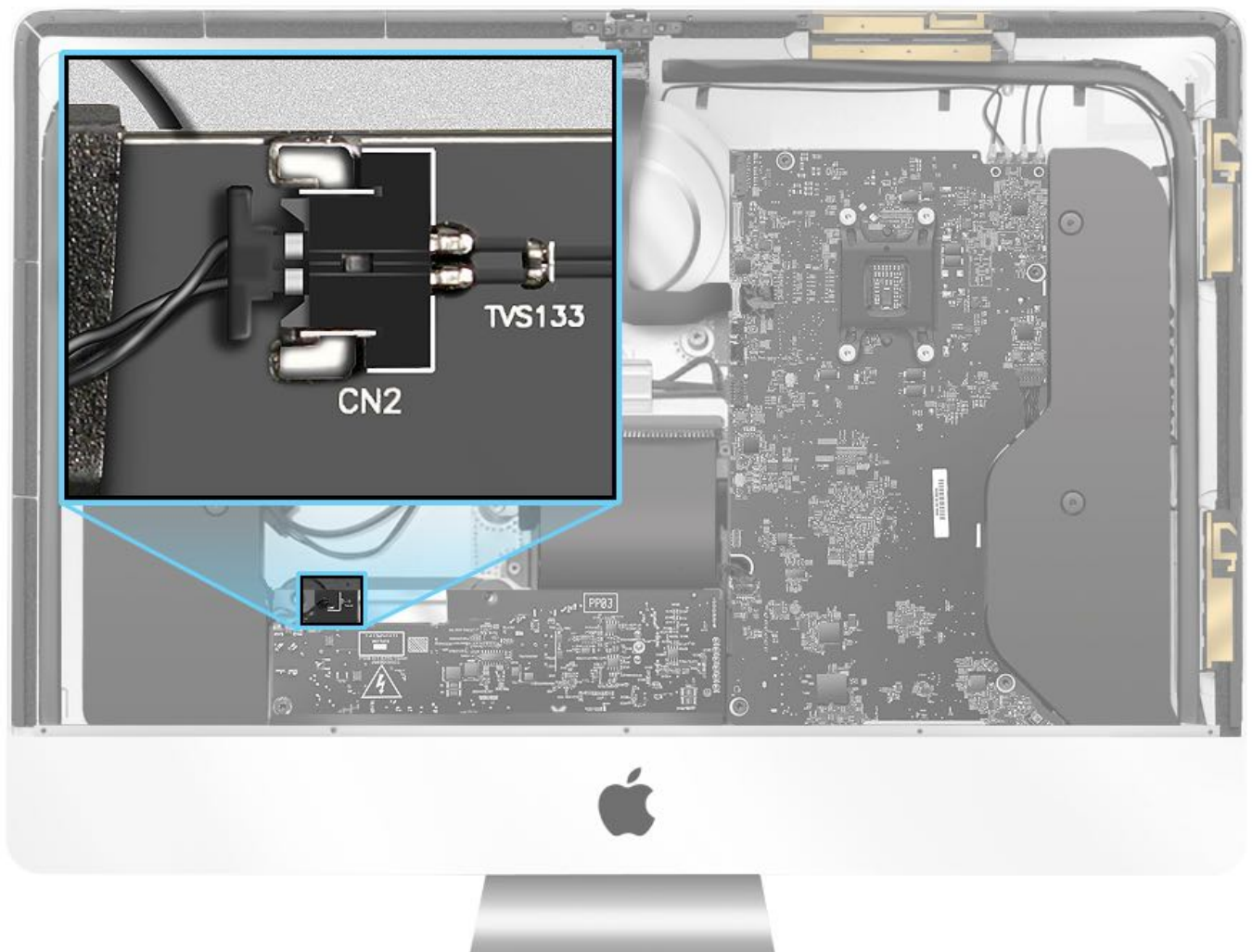
1. Carefully slip power supply under rear housing chin.



2. Connect AC filter cable to rear housing. The cable only connects one direction.



3. Connect power button cable to power supply and route it into the left speaker. **Note:** If the power button cable breaks, the rear housing will need to be replaced. The power button cable is not available separately.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Stand

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

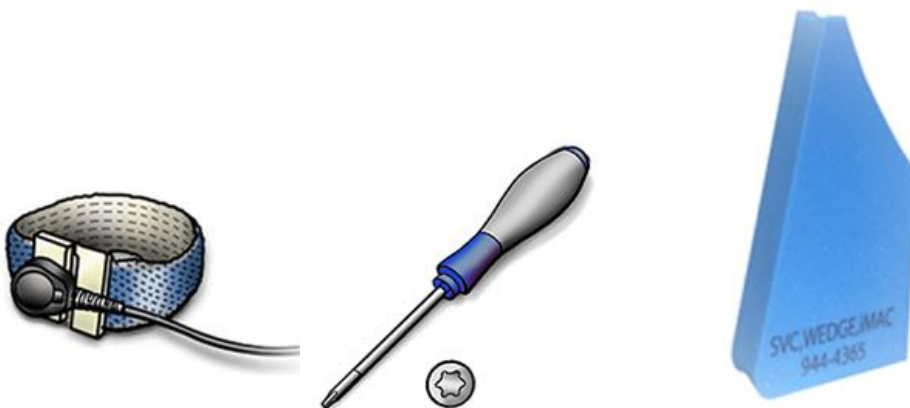
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)
- [Logic Board](#)

Note: The chin strap must be removed for this repair.



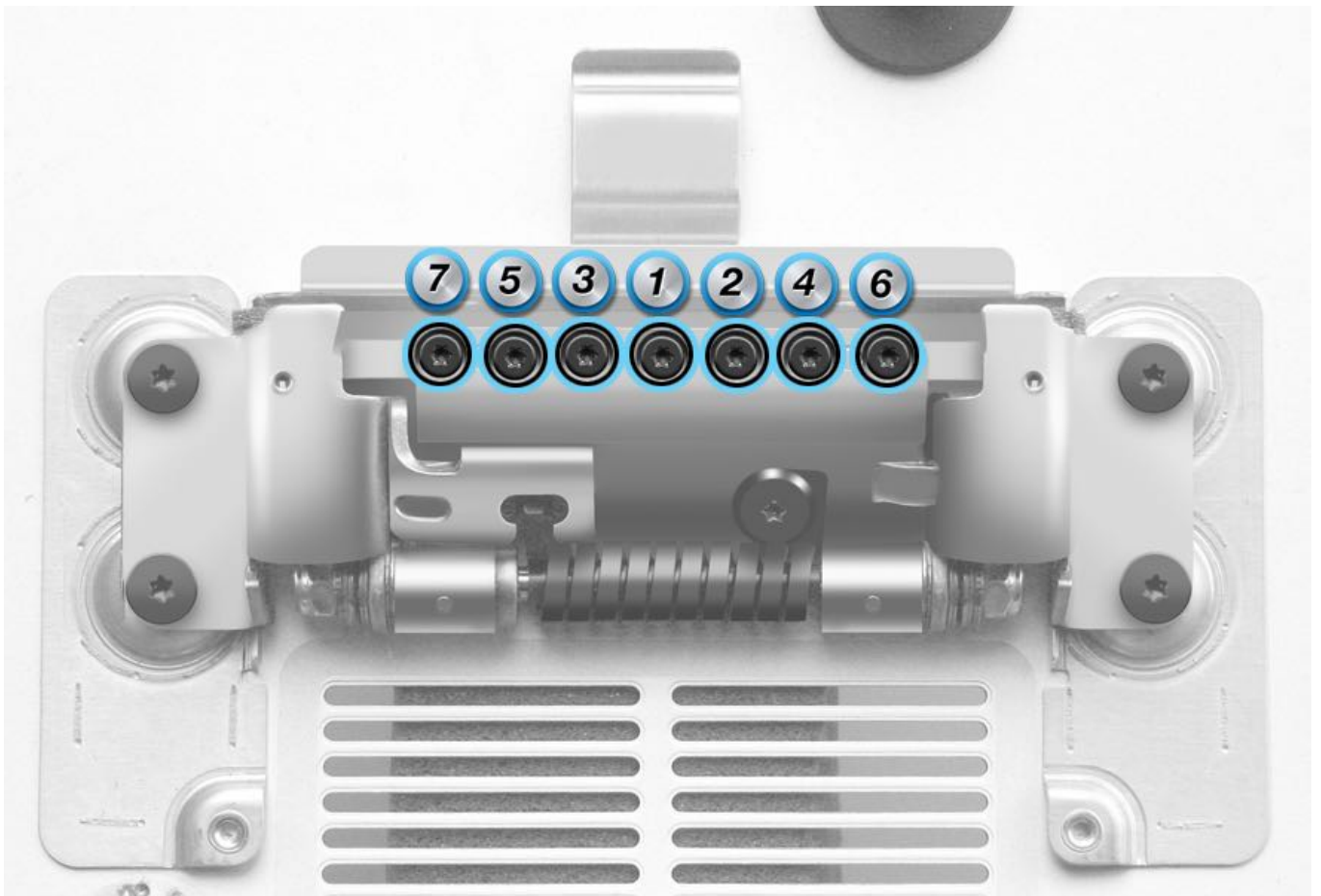
Tools

- ESD wrist strap
- Magnetized Torx 8 screwdriver
- Service wedge, iMac



Steps For Removal

1. Remove seven (7) 7.5mm T8 screws (922-0329) in the following order:

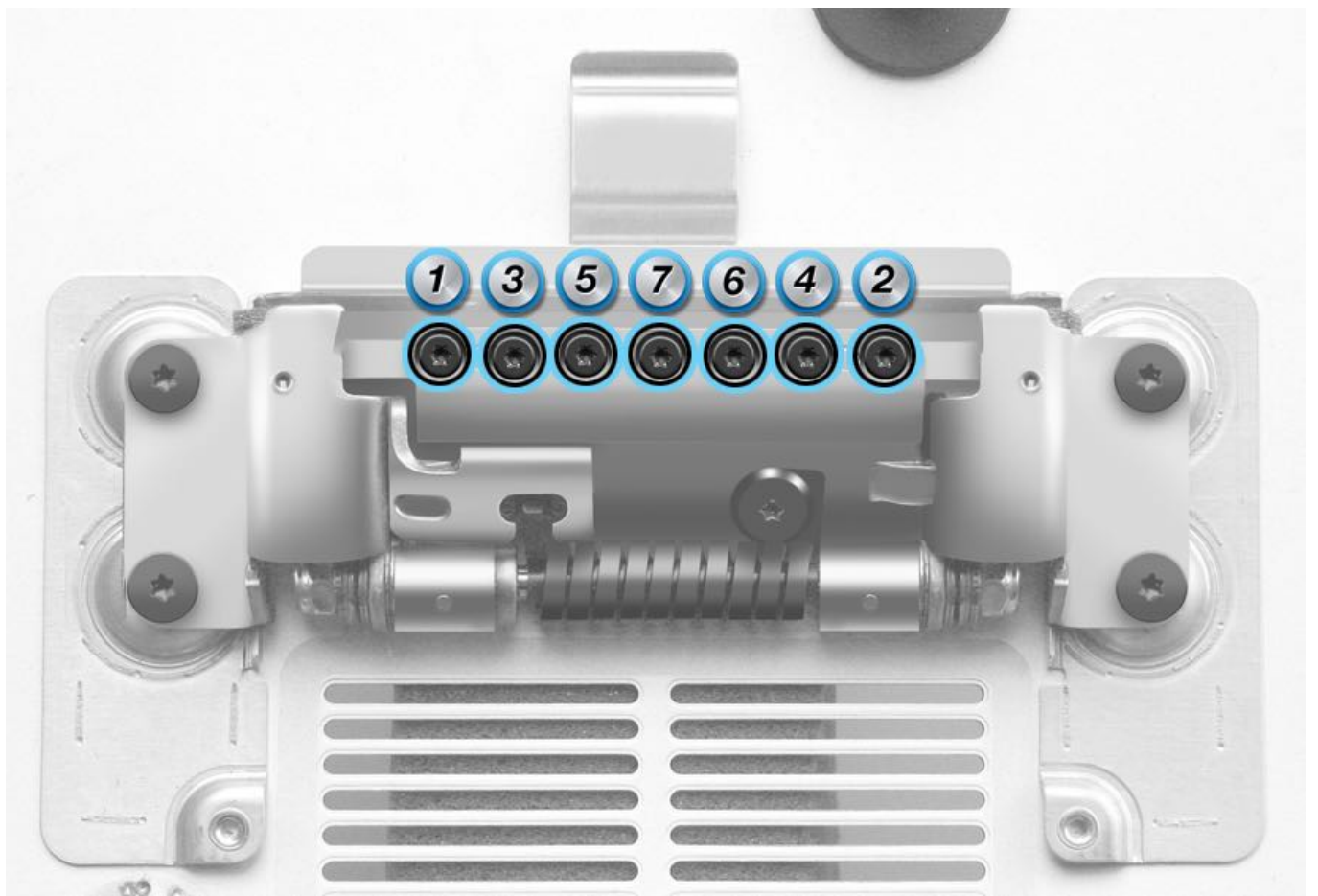


2. Lift rear housing off stand.



Steps For Reassembly

1. Line up the two pins on the stand with the pin holes on the mechanism.
2. Install seven (7) 7.5mm T8 screws (922-0329) in the following order:



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Mechanism

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

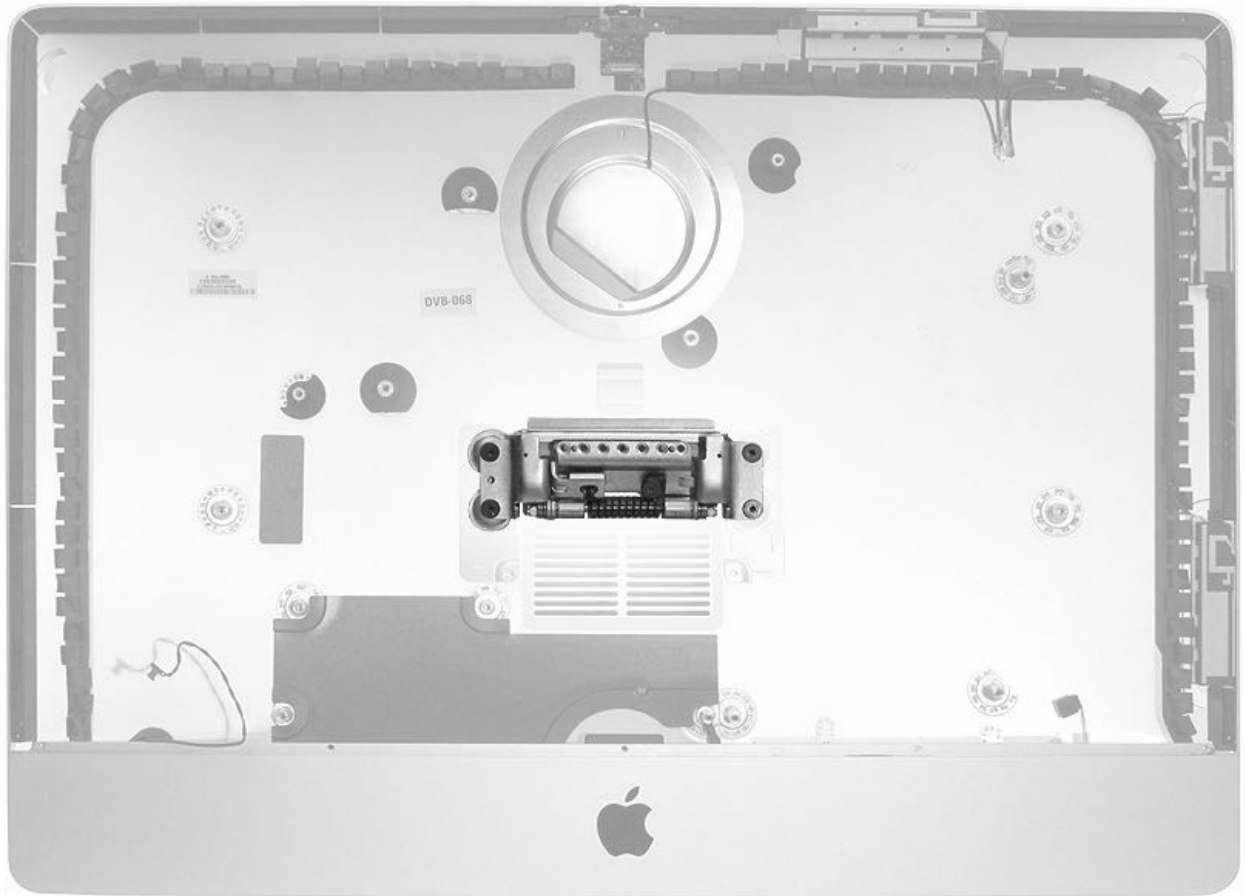
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Right Speaker](#)
- [Logic Board](#)
- [Stand](#)

Note: The chin strap must be removed for this repair.



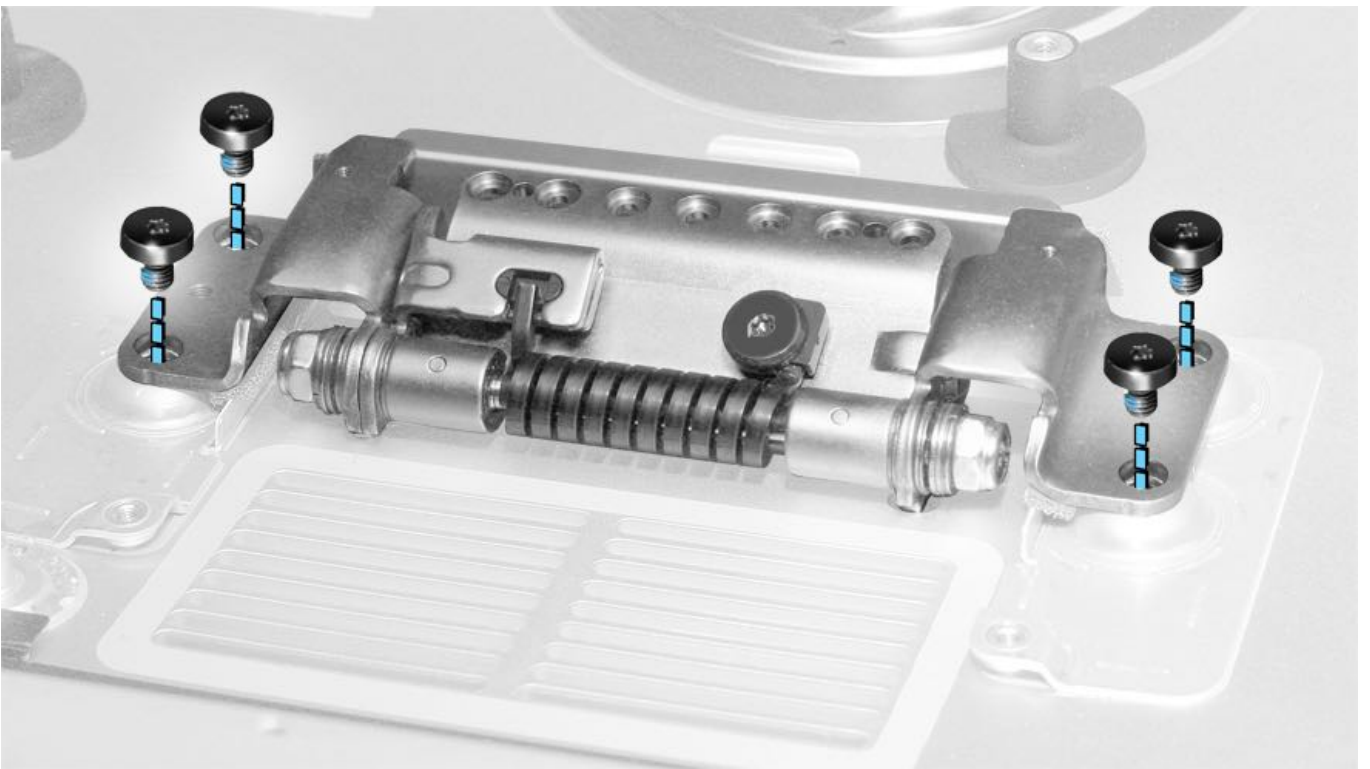
Tools

- ESD wrist strap and mat
- Magnetized Torx 10 screwdriver
- Soft cloth



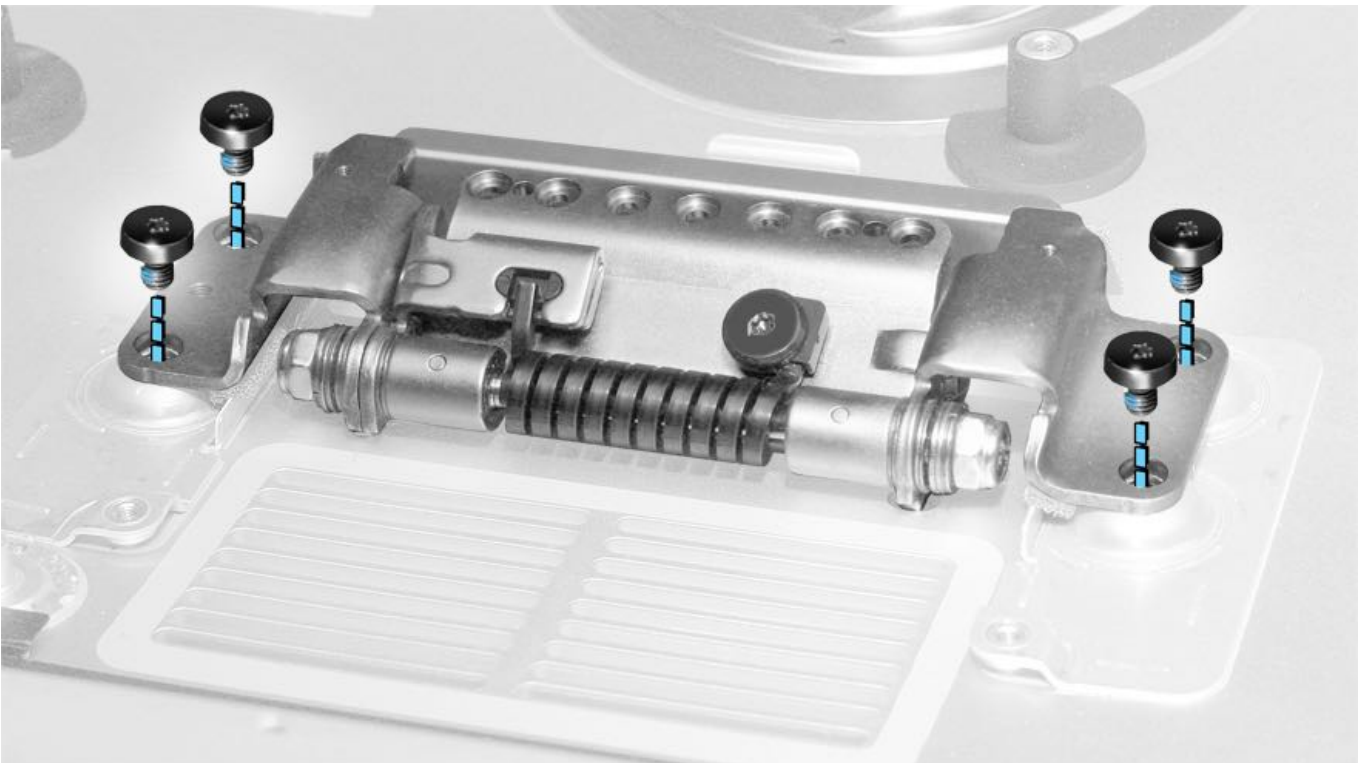
Steps For Removal

1. Lay computer on a soft cloth.
2. Remove four (4) T10 screws, 923-0334.
3. Lift mechanism off rear housing.



Steps For Reassembly

1. Position mechanism in rear housing.
2. Install four (4) T10 screws, 923-0334.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Rear Housing

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Camera](#)
- [Camera/Microphone Cable](#)
- [Bluetooth Antenna, Upper](#)
- [Wi-Fi Antenna, Mid](#)
- [Wi-Fi Antenna, Lower](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Left Speaker](#)
- [Right Speaker](#)
- [Logic Board](#)
- [Power Supply](#)
- [Stand](#)

Note: The chin strap must be removed for this repair.



Tools

- ESD wrist strap
- Lint-free cloth



Steps For Removal

Rear Housing Service Strategy: The original rear housing (923-0265) is being replaced by rear housing (923-0449). Use only (923-0449) rear housing and service parts.

1. Lay rear housing on soft cloth to avoid scratching.
2. With all other modules removed, rear housing is the remaining assembly.

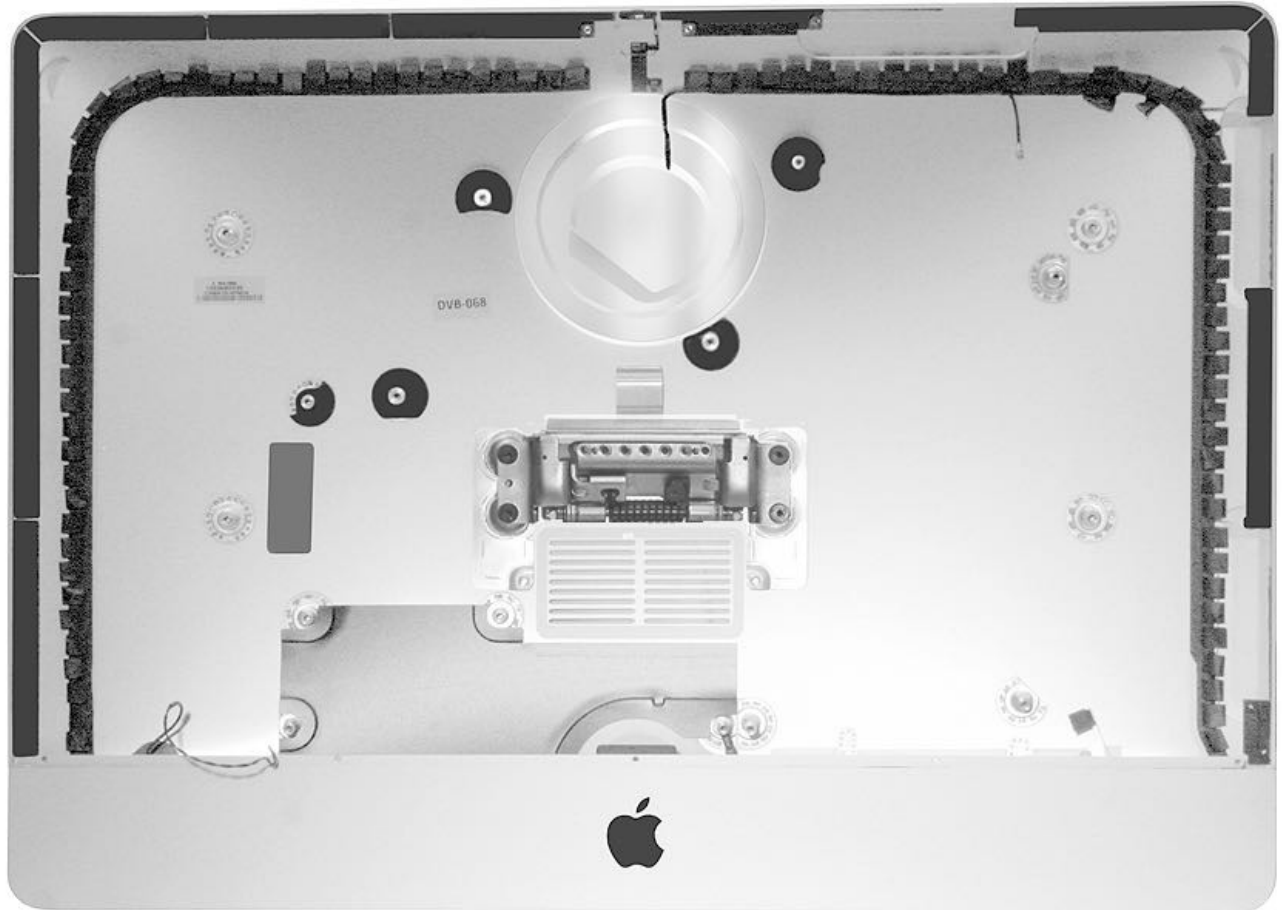
A new iMac (21.5-inch, Late 2012, Early 2013) rear housing includes the following parts, which are **NOT** available separately:

- Wi-Fi antenna in silver circle behind Apple logo
- Microphone
- Power button and cable
- AC inlet
- Audio input jack and cable
- Gaskets

A new iMac (21.5-inch, Late 2012, Early 2013) rear housing includes the following parts which are **ARE** available separately:

- Mechanism
- Mechanism screws

iMac (21.5-inch, Late 2012, Early 2013)



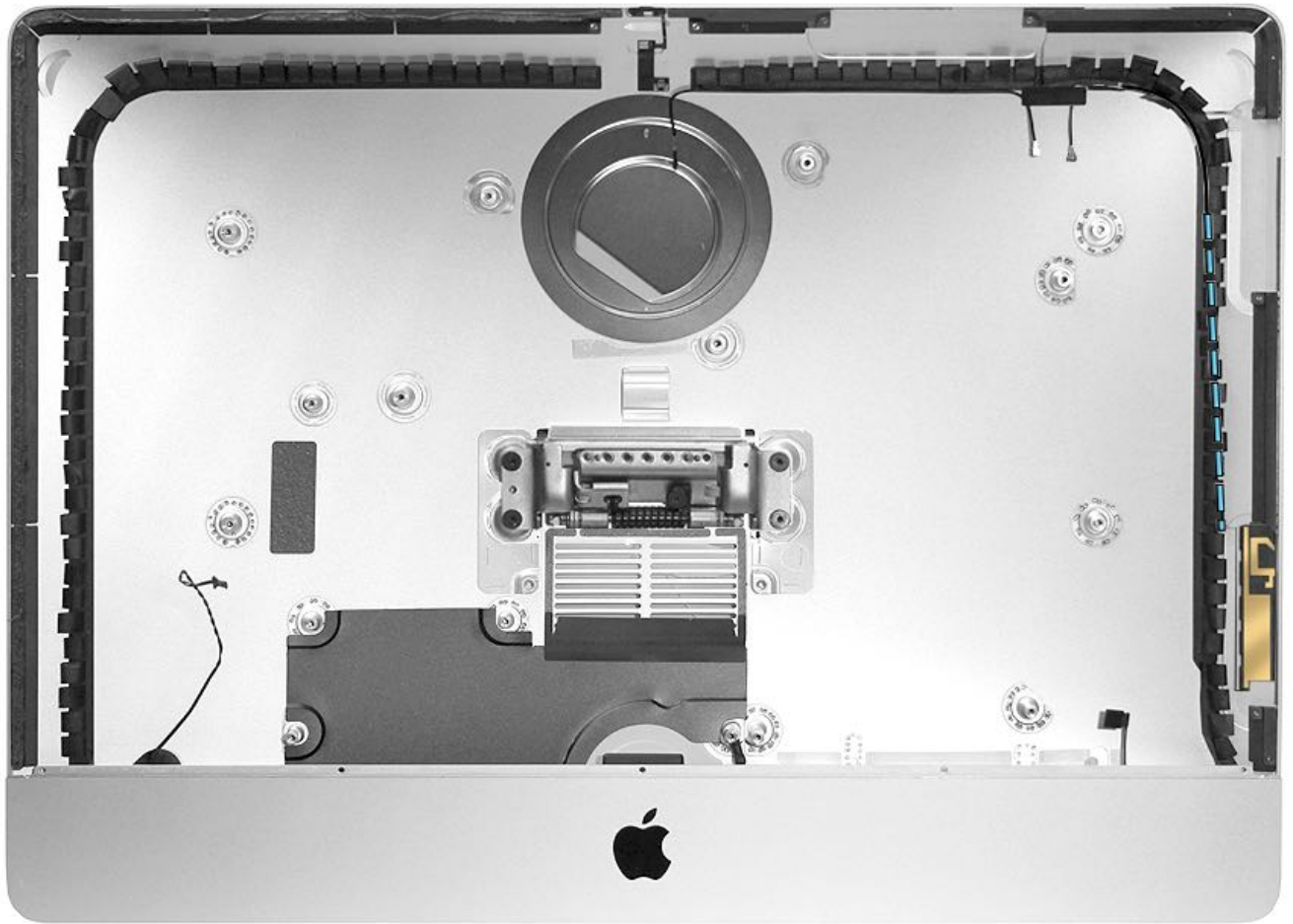
iMac (21.5-inch, Late 2013)

A new iMac (21.5-inch, Late 2013) rear housing includes the following parts, which are **NOT** available separately:

- Wi-Fi antenna in silver circle behind Apple logo
- Microphone
- Power button and cable
- AC inlet
- Audio input jack and cable
- Gaskets

A new iMac (21.5-inch, Late 2013) rear housing includes the following parts which are **ARE** available separately:

- Mechanism
- Mechanism screws
- Wi-Fi Antenna, Lower



Steps For Reassembly

1. Transfer Bluetooth (upper antenna), Wi-Fi antenna (middle antenna) and insulator tape (that secures the antennas) to rear housing.
2. Route antennas under insulator tape. Press tape securely to rear housing.
3. Reinstall remaining modules including the 5-hole chin strap.

Handling Rear Housing

Always handle rear housing with two (2) hands in the lower left and right corners. Never carry the rear housing with a single hand, or by holding the aluminum “chin” (where Apple logo appears on lower front).

Handling rear housing part incorrectly could flex aluminum and cause alignment issues.



Reassemble in reverse order of removal steps.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): VESA Mount Adapter

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

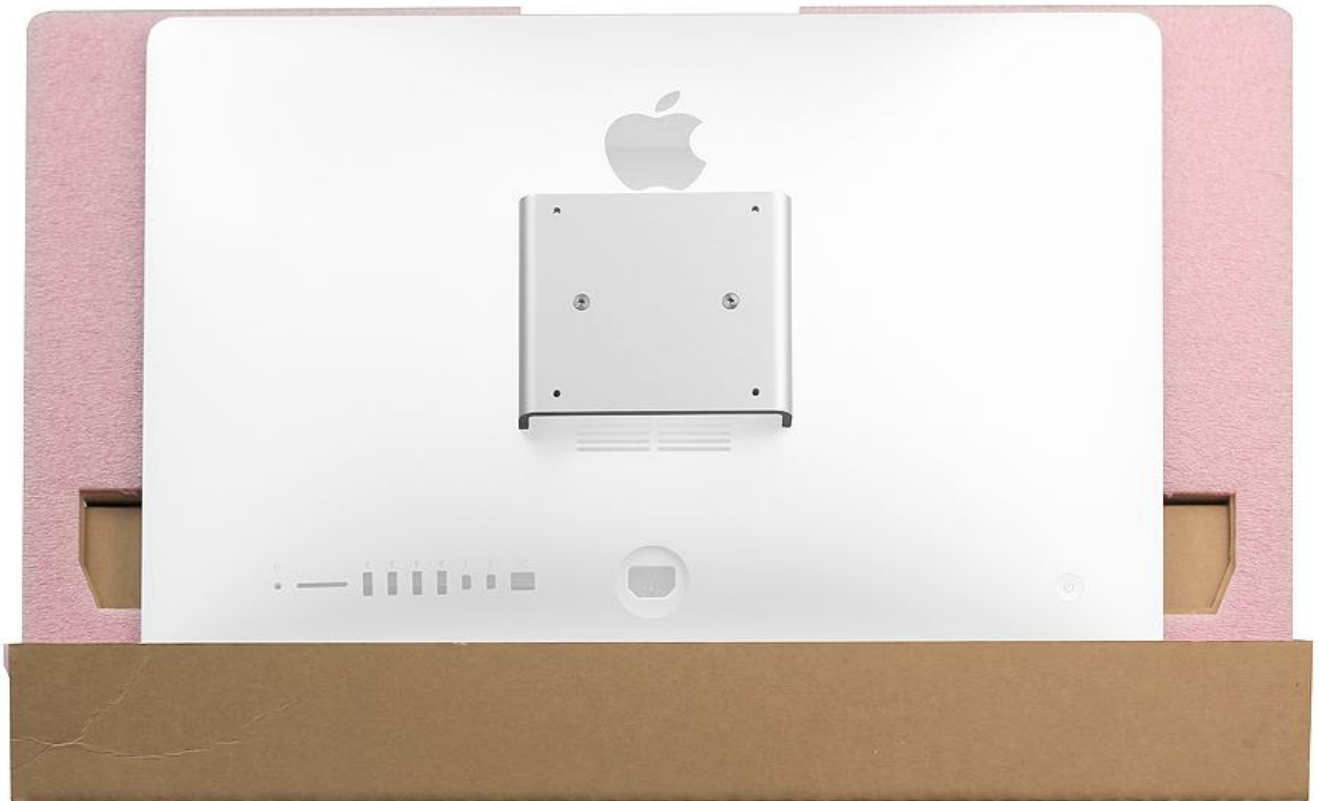
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

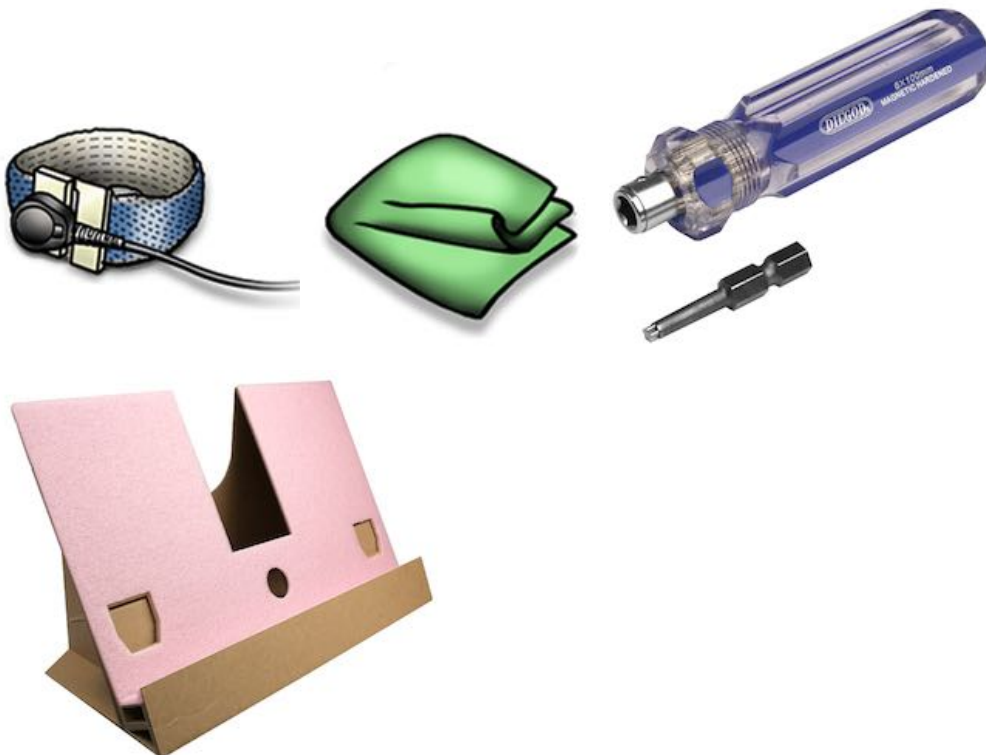
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Camera](#)
- [Camera/Microphone Cable](#)
- [Bluetooth Antenna, Upper](#)
- [Wi-Fi Antenna, Mid](#)
- [Wi-Fi Antenna, Lower](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Left Speaker](#)
- [Right Speaker](#)
- [Logic Board](#)
- [Power Supply](#)

Note: The chin strap must be removed for this repair.



Tools

- ESD wrist strap and mat
- Lint-free cloth
- Kit, LCD Display, VHB for VESA systems (076-1437) (not pictured)
- VESA Pentalobe driver (923-0367)
- LCD Service Support Stand (923-0416)

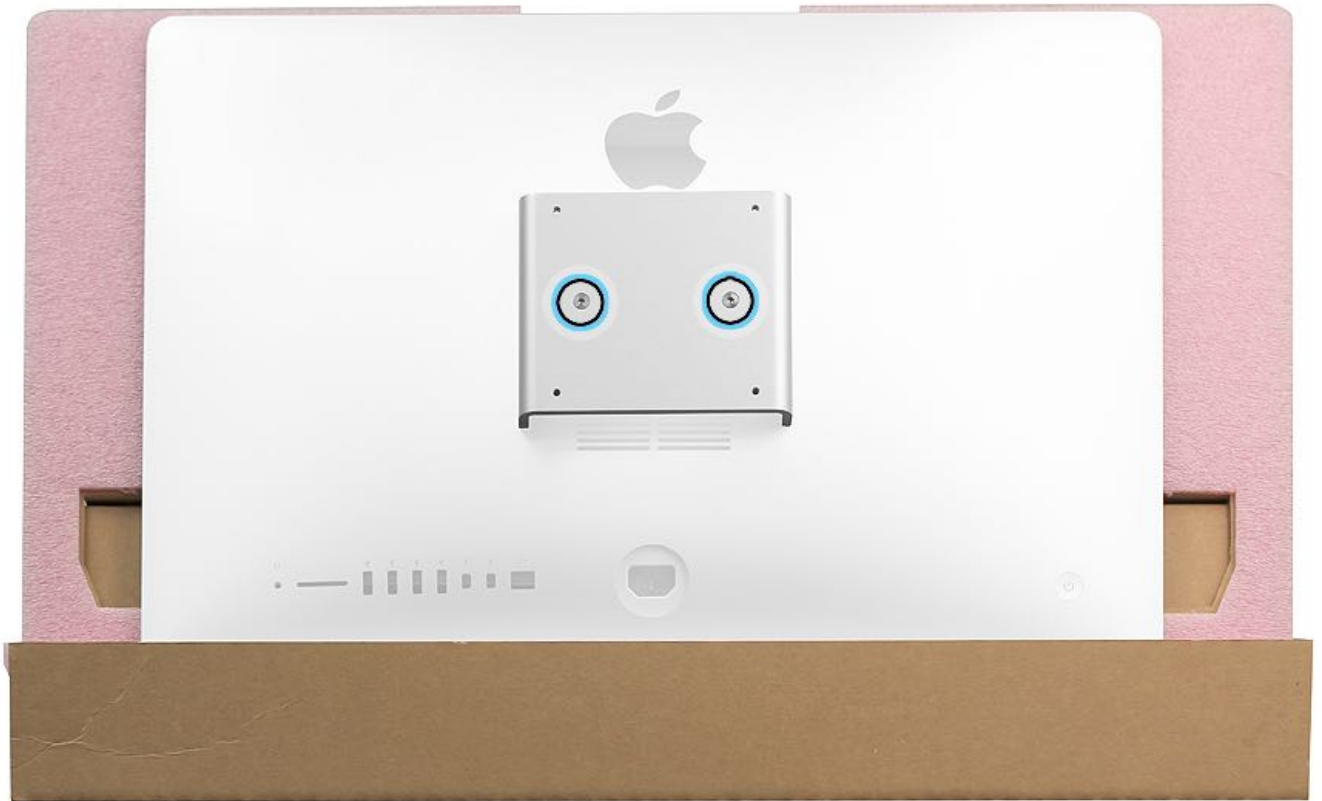


Steps For Removal

1. Place rear housing on LCD support stand, with VESA mount adapter facing you.
2. Remove two (2) pentalobe screws (923-0417).

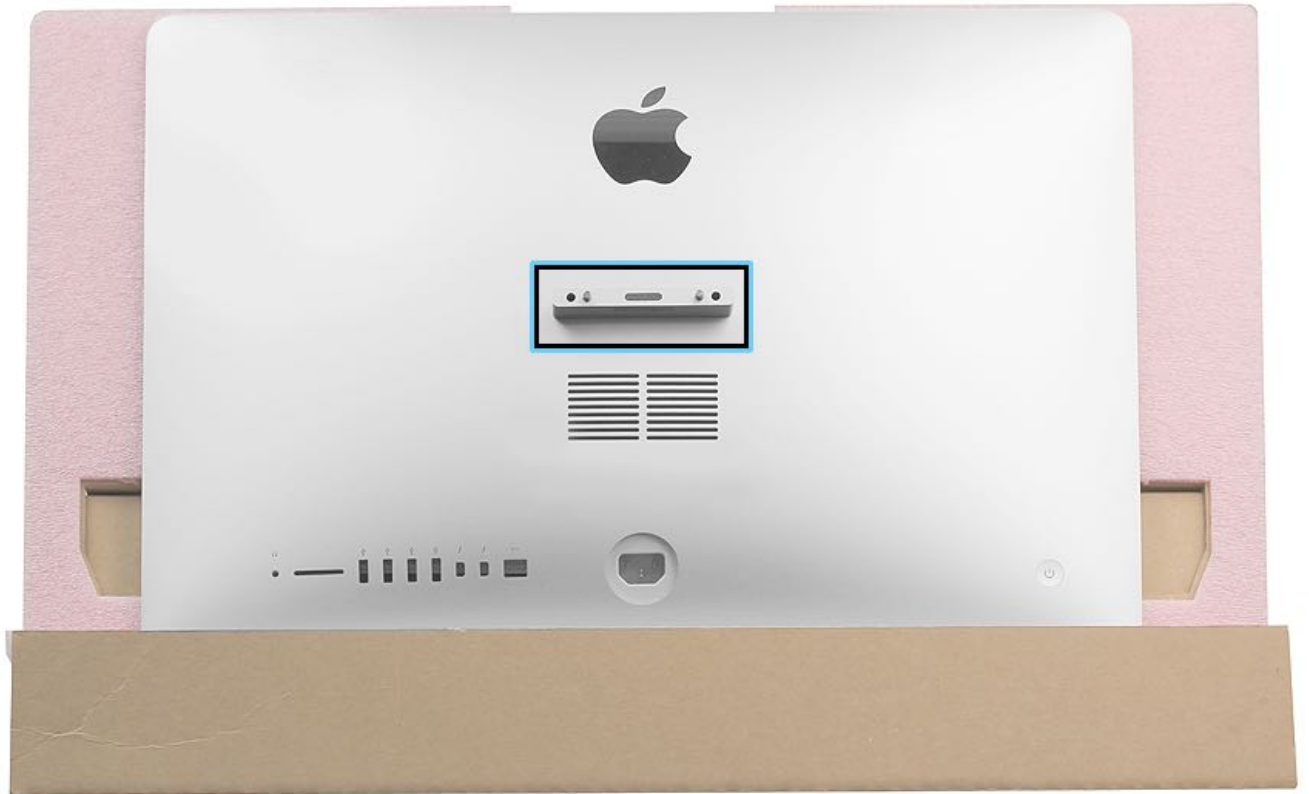


3. Lift VESA mount adapter off rear housing.

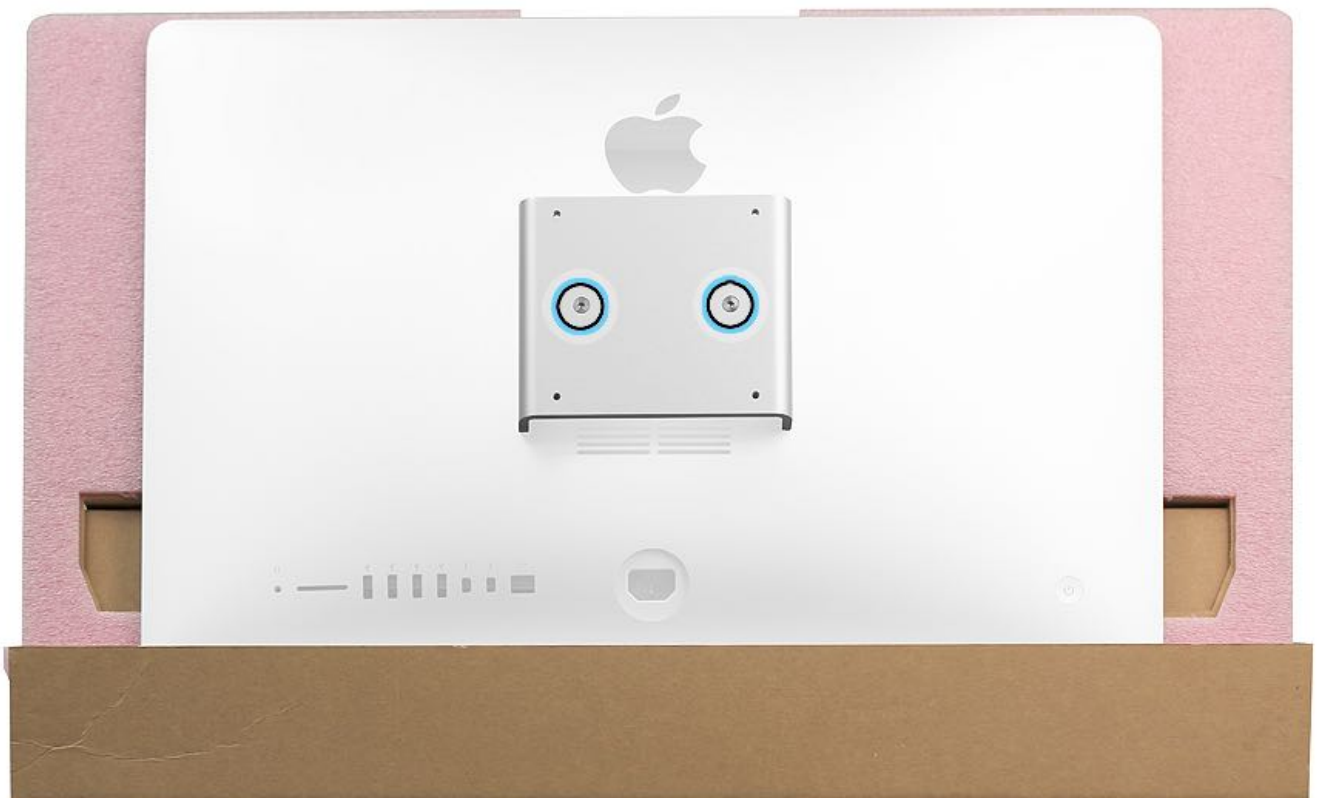


Steps For Reassembly

1. Insert VESA tongue into opening on rear housing (if removed).



2. Replace VESA mount adapter and two (2) pentalobe screws (923-0417).



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): VESA Mechanism Plate

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

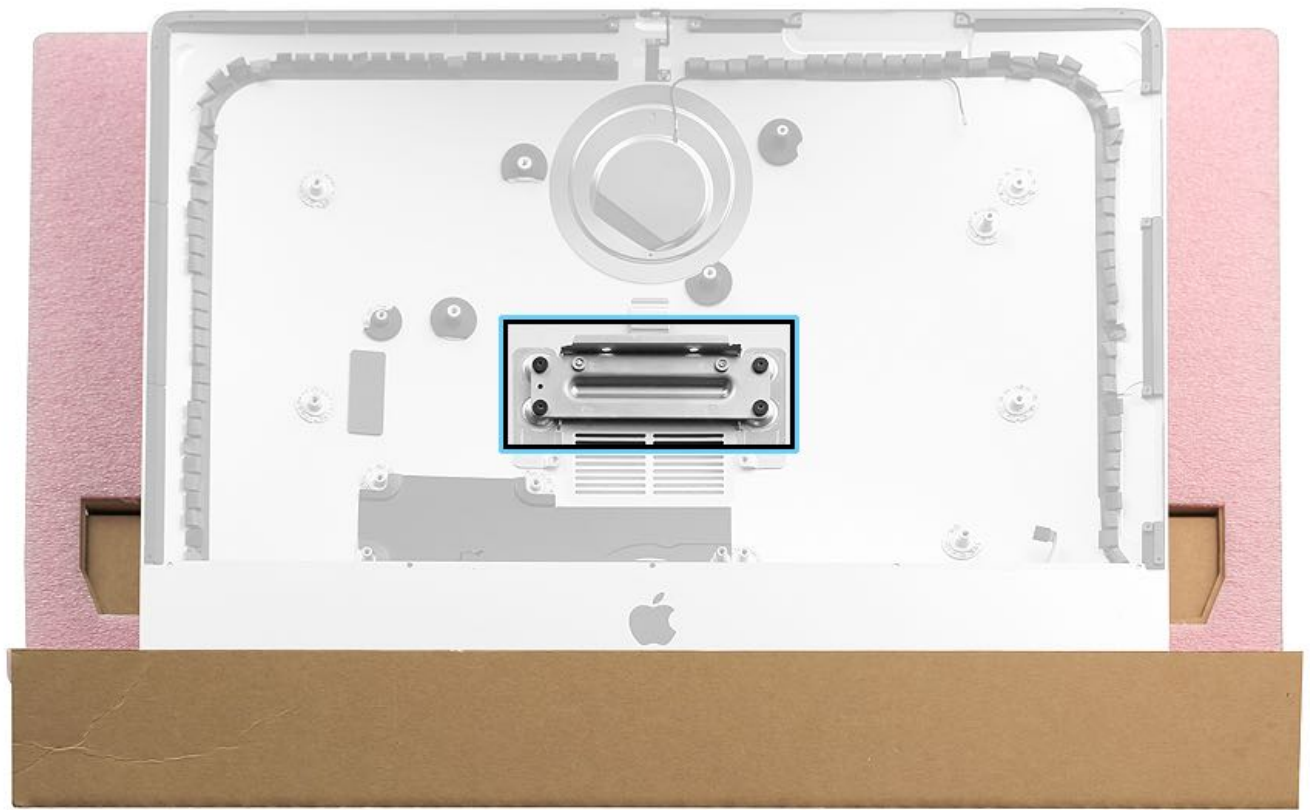
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Camera](#)
- [Camera/Microphone Cable](#)
- [Bluetooth Antenna, Upper](#)
- [Wi-Fi Antenna, Mid](#)
- [Wi-Fi Antenna, Lower](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Left Speaker](#)
- [Right Speaker](#)
- [Logic Board](#)
- [Power Supply](#)
- [VESA Mount Adapter](#)
- [VESA Tongue](#)

Note: The chin strap must be removed for this repair.



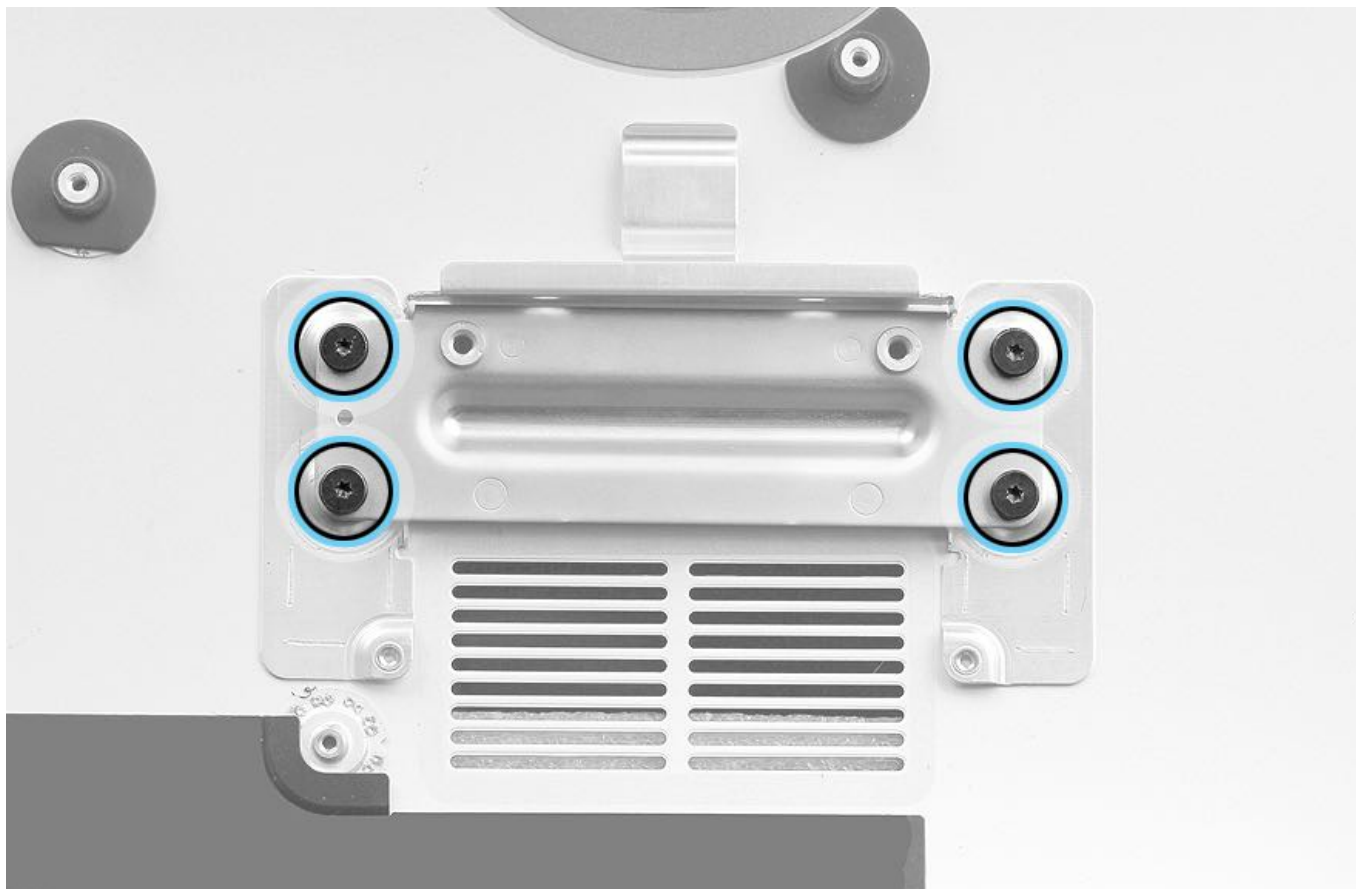
Tools

- ESD wrist strap and mat
- Lint-free cloth
- LCD Service Support Stand (923-0416)
- Torx T10
- Kit, LCD Display, VHB for VESA systems (076-1437) (not pictured)



Steps For Removal

1. Place computer on LCD Service Support Stand.
2. Remove four (4) T10 screws (923-0334).



Steps For Reassembly

1. Position VESA mechanism plate in rear housing.
2. Install four (4) T10 screws (923-0334).





3. Install VESA mount adapter and VESA tongue.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): VESA Rear Housing

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

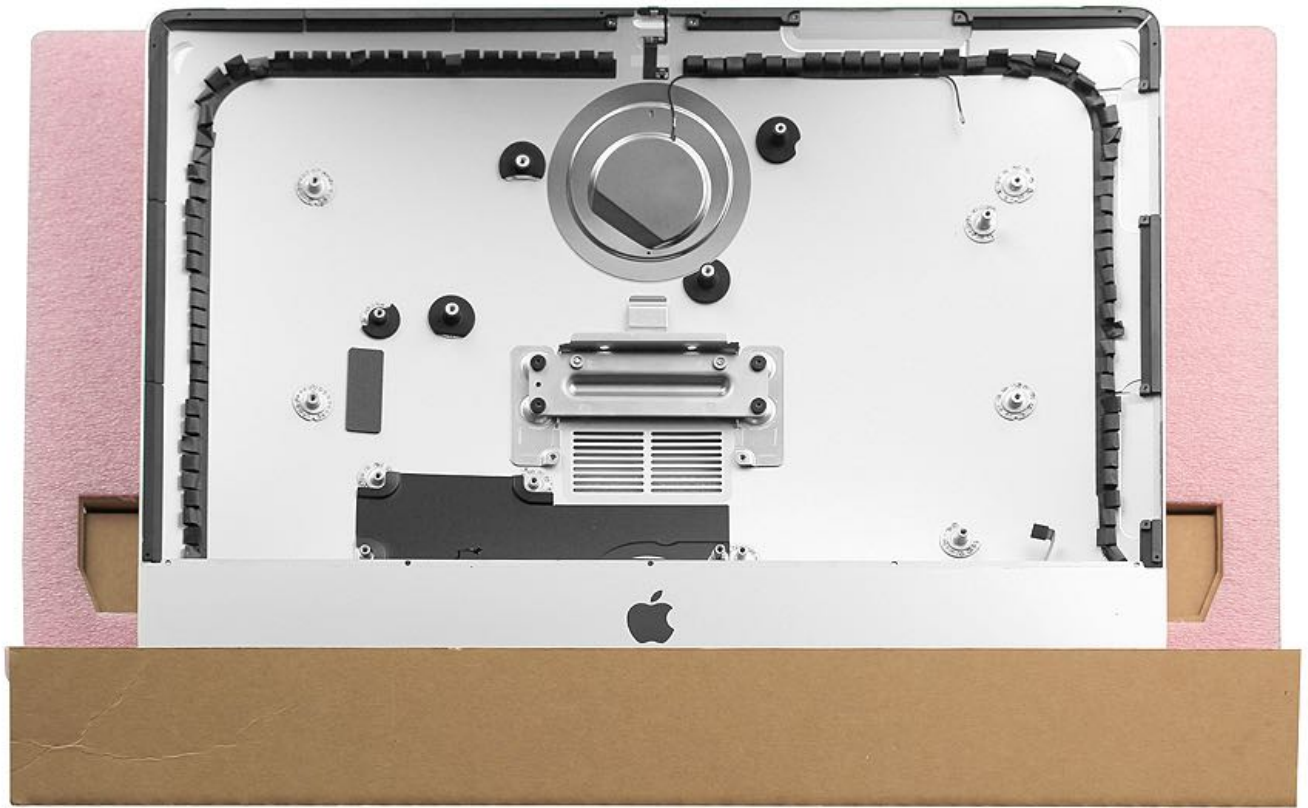
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

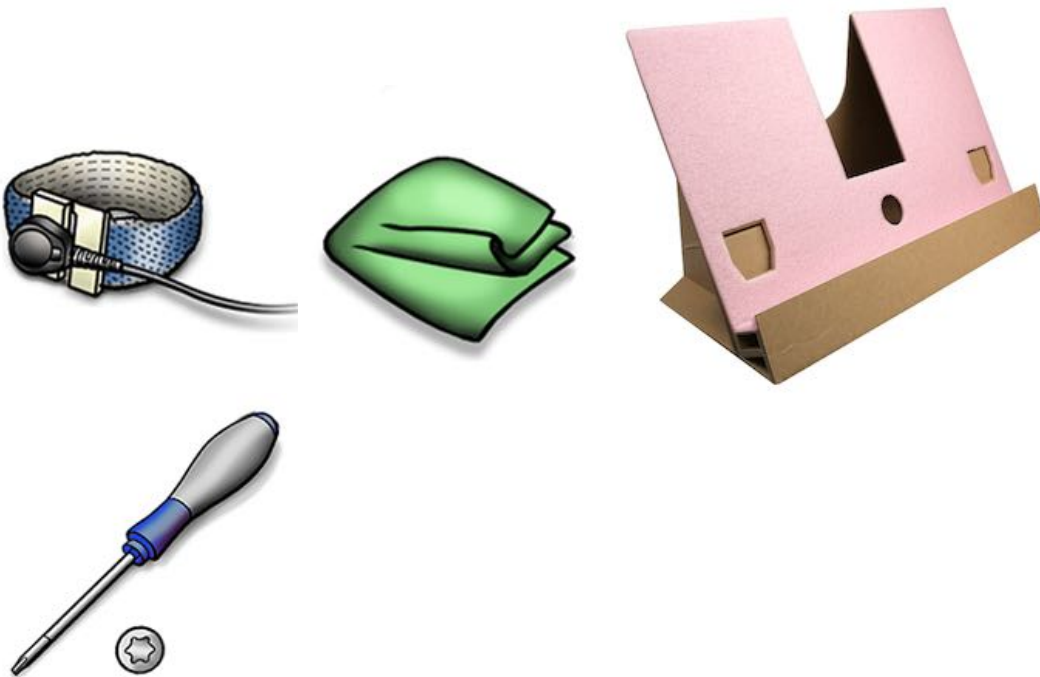
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Camera](#)
- [Camera/Microphone Cable](#)
- [Bluetooth Antenna, Upper](#)
- [Wi-Fi Antenna, Mid](#)
- [Wi-Fi Antenna, Lower](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Left Speaker](#)
- [Right Speaker](#)
- [Logic Board](#)
- [Power Supply](#)
- [VESA Mount](#)
- [VESA Tongue](#)

Note: The chin strap must be removed for this repair.



Tools

- ESD wrist strap and mat
- Lint-free cloth
- Kit, LCD Display, VHB for VESA systems (076-1437) (not pictured)
- LCD Service Support Stand (923-0416)
- Torx T10, T8, T4



Steps For Removal

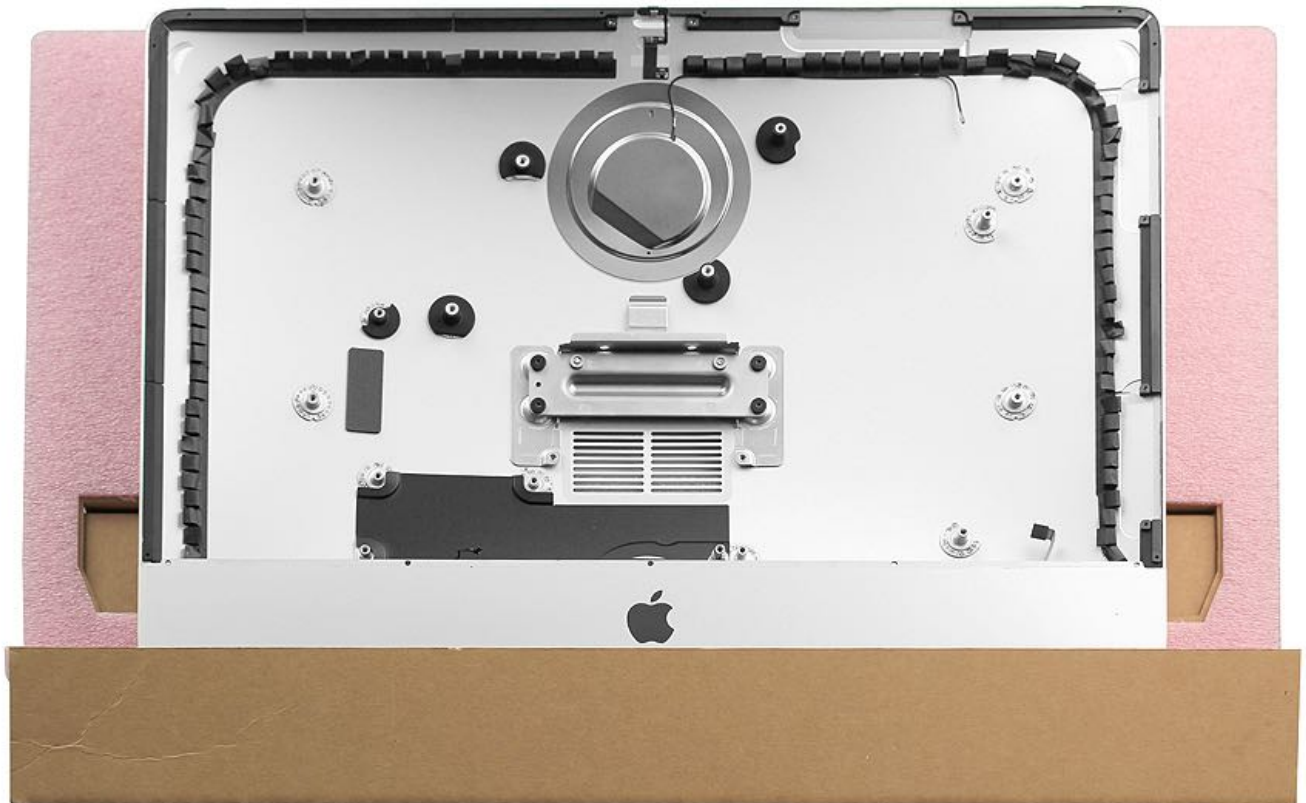
1. Place computer on LCD Service Support Stand to remove all modules listed above.
2. With all modules removed, the VESA rear housing is the remaining part.

A new VESA rear housing (923-0425) includes the following parts which **ARE NOT** available separately:

- Wi-Fi antenna in silver circle behind Apple logo
- microphone
- power button and cable
- AC inlet
- gaskets
- wireless antenna insulators

A new VESA rear housing (923-0425) includes the following parts which are **ARE** available separately:

- VESA backing plate (923-0419)
- VESA backing plate screws (923-0334)
- VESA pentalobe screws (923-0417)



Steps For Reassembly

Caution: Always handle rear housing with two hands in lower left and right corners. Never carry rear housing with a single hand or push in or pull out on the chin.

Important: Handling rear housing incorrectly could flex aluminum and cause alignment issues.

1. Transfer Bluetooth and Wi-Fi antennas to rear housing.
2. Install Bluetooth and Wi-Fi antenna insulators. Peel adhesive backing off insulators, attach to rear housing, and route antennas under insulator.
3. Transfer hard drive cradle.
4. Transfer VESA mount and VESA tongue.
5. Reinstall remaining modules.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): VESA Tongue

First Steps

IMPORTANT: This procedure is restricted to ACMT certified technicians who have passed the iMac (Late 2012, Early 2013, and Late 2013) qualification exam (9L0-S04). This one exam qualifies technicians to service the following products:

- iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013)
- iMac (21.5-inch, Early 2013)
- iMac (21.5-inch, Late 2012) and iMac (27-inch, Late 2012)

Note: Technicians who have previously passed the 9L0-S04 are automatically qualified to service the iMac (21.5-inch, Late 2013) and iMac (27-inch, Late 2013). There is no need to retake the exam.

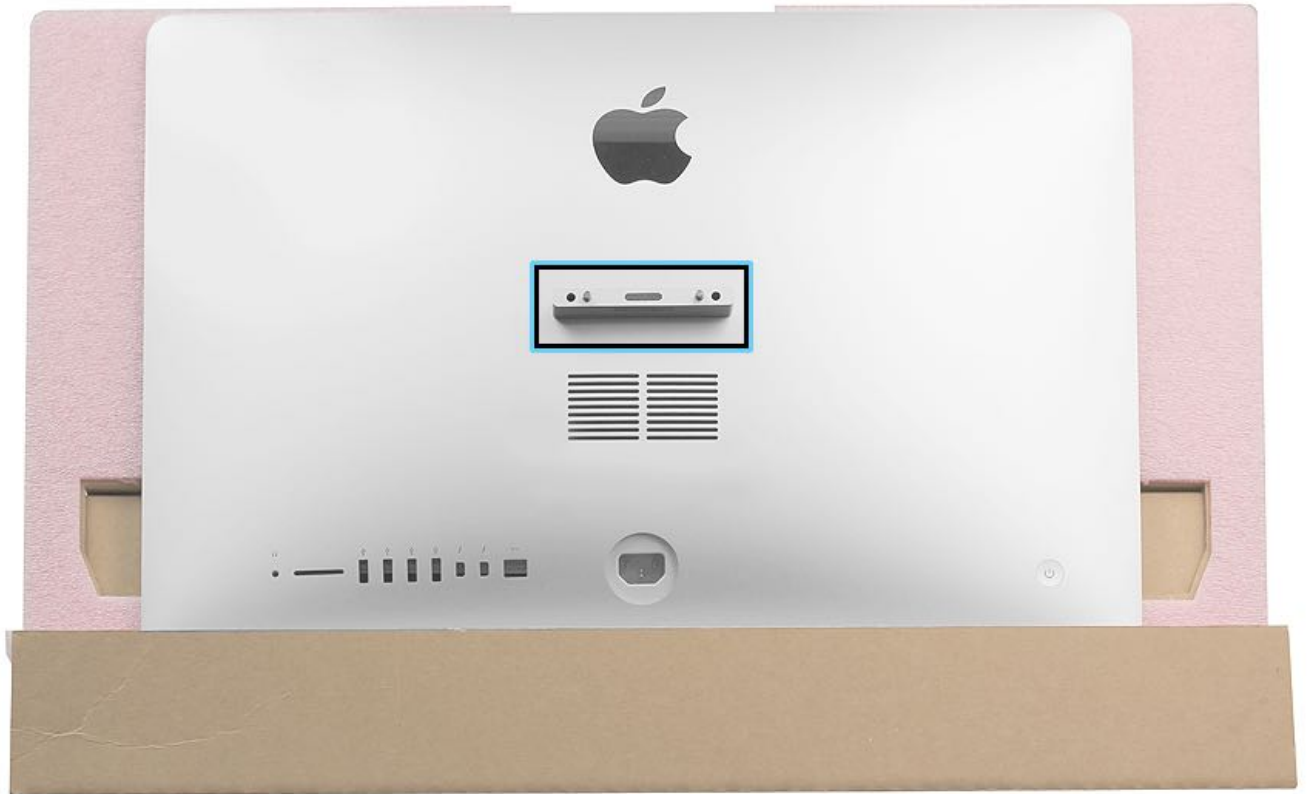
For more information about this service qualification, refer to Apple Support article [TP970: Becoming Qualified for iMac \(Late 2012, Early 2013 and Late 2013\) Repairs](#).

Before you begin:

Remove:

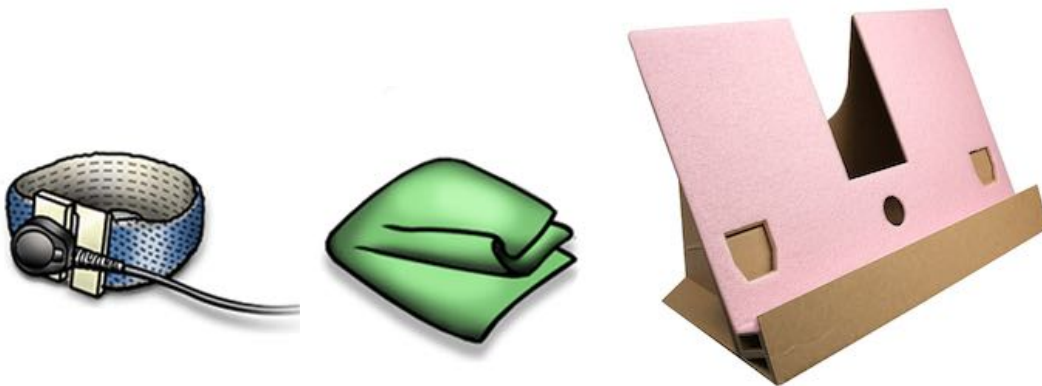
- [Display Panel](#)
- [Display Panel VHB Strips](#)
- [Camera](#)
- [Camera/Microphone Cable](#)
- [Bluetooth Antenna, Upper](#)
- [Wi-Fi Antenna, Mid](#)
- [Wi-Fi Antenna, Lower](#)
- [Fan](#)
- [Hard Drive Brackets](#)
- [Hard Drive](#)
- [Loosen Power Supply](#)
- [Hard Drive Cradle](#)
- [Chin Strap](#)
- [Left Speaker](#)
- [Right Speaker](#)
- [Logic Board](#)
- [Power Supply](#)
- [VESA Mechanism Plate](#)

Note: The chin strap must be removed for this repair.



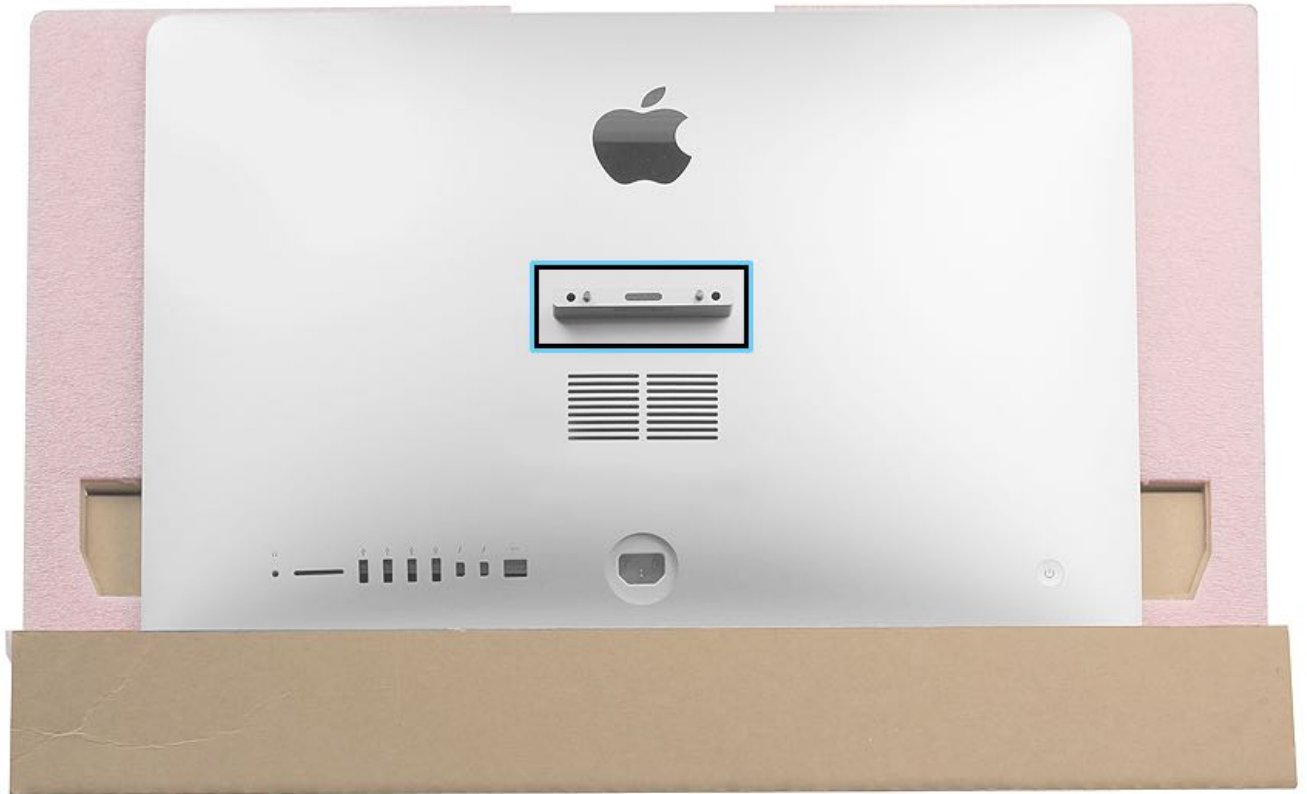
Tools

- ESD wrist strap and mat
- Lint-free cloth
- Kit, LCD Display, VHB for VESA systems (076-1437) (not pictured)
- LCD Service Support Stand (923-0416)



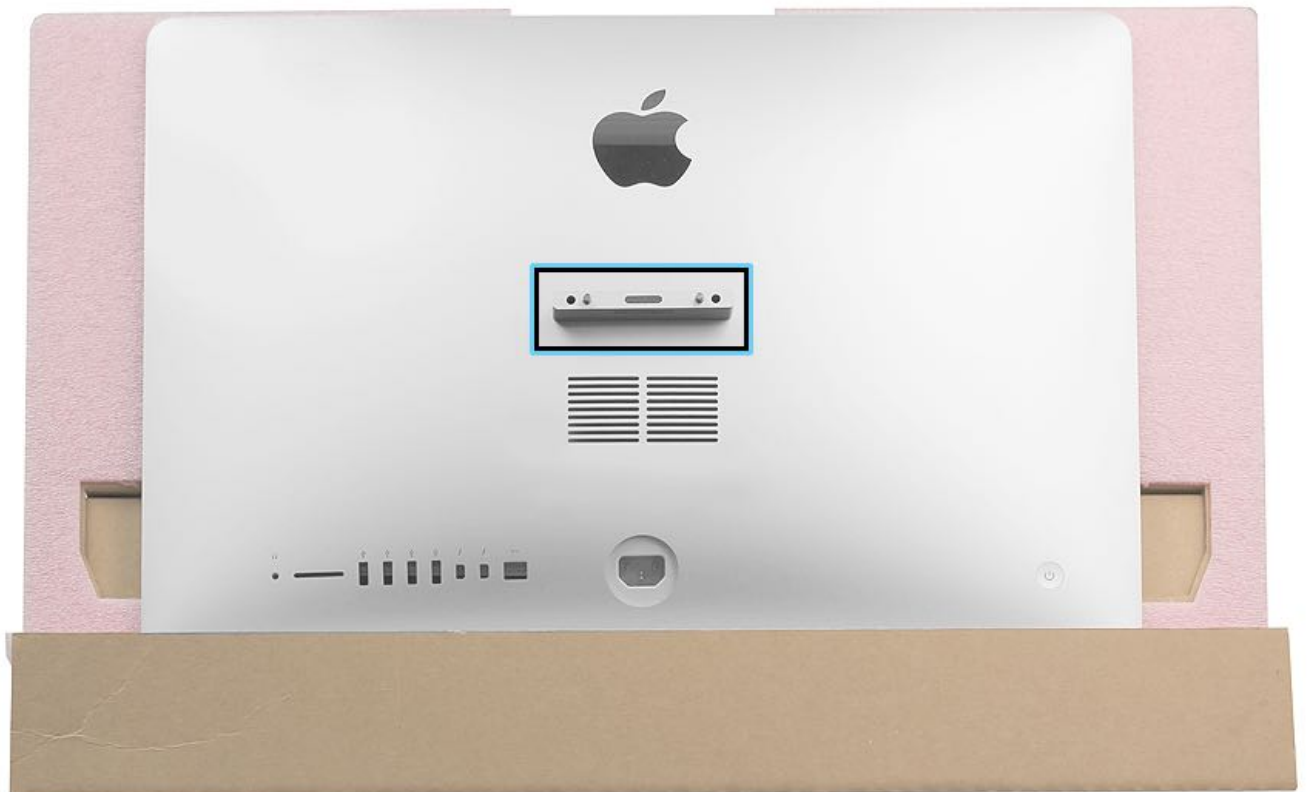
Steps For Removal

1. Place rear housing on LCD support stand, with VESA tongue facing you.
2. Pull VESA tongue off rear housing. **Note:** Computer serial number is on underside of VESA tongue.



Steps For Reassembly

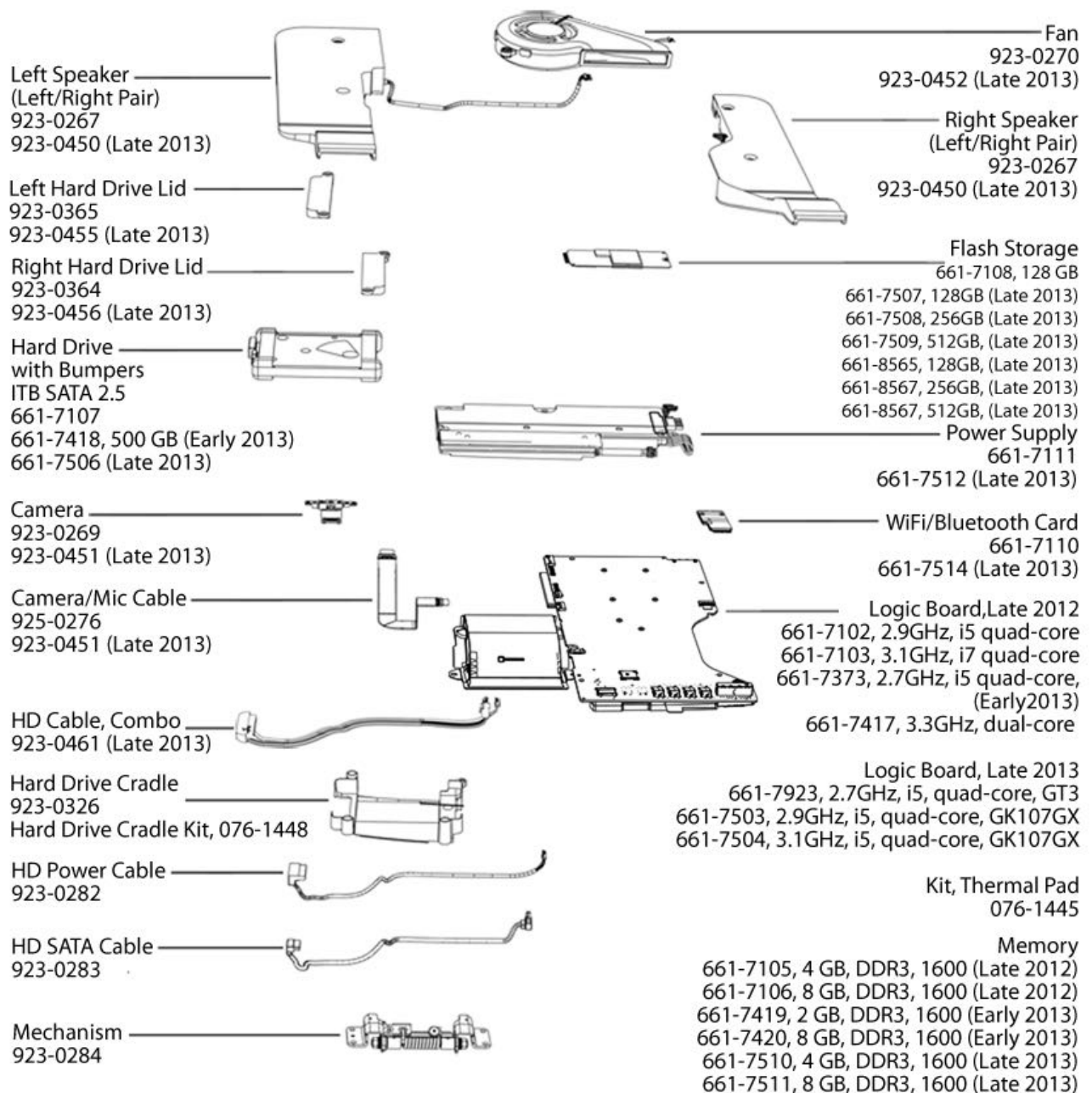
1. Insert VESA tongue into opening on rear housing.



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Exploded Views

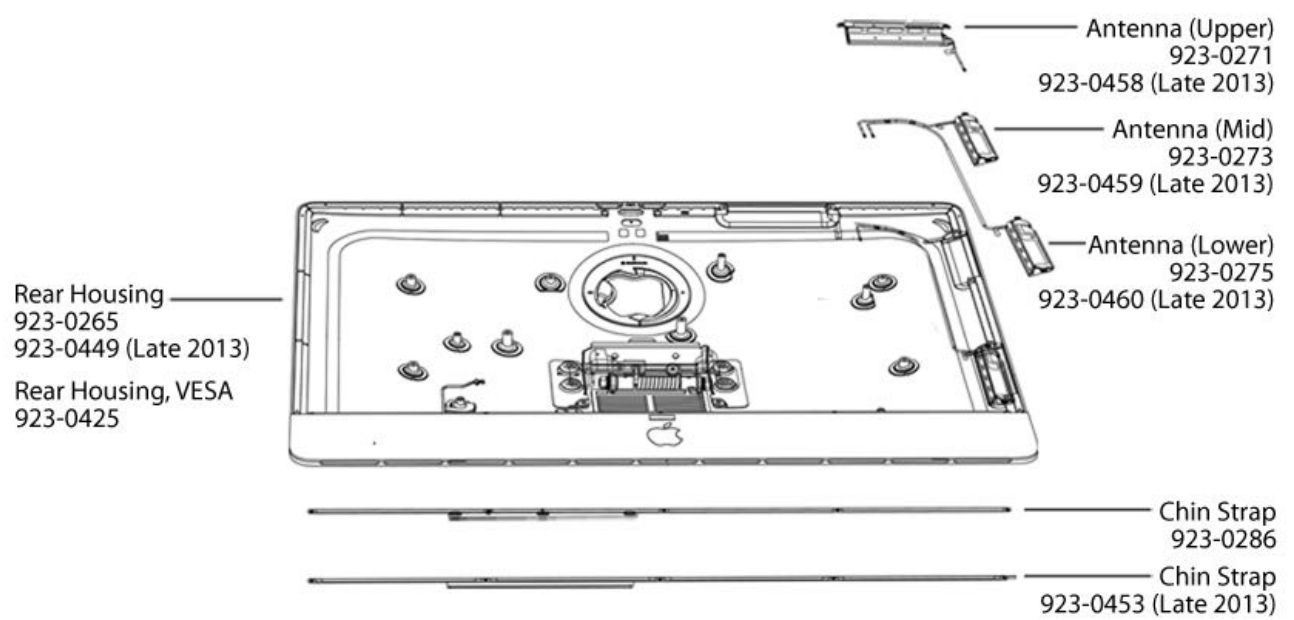
Exploded View #1

iMac (21.5-inch, Late 2012, Early 2013, Late 2013)



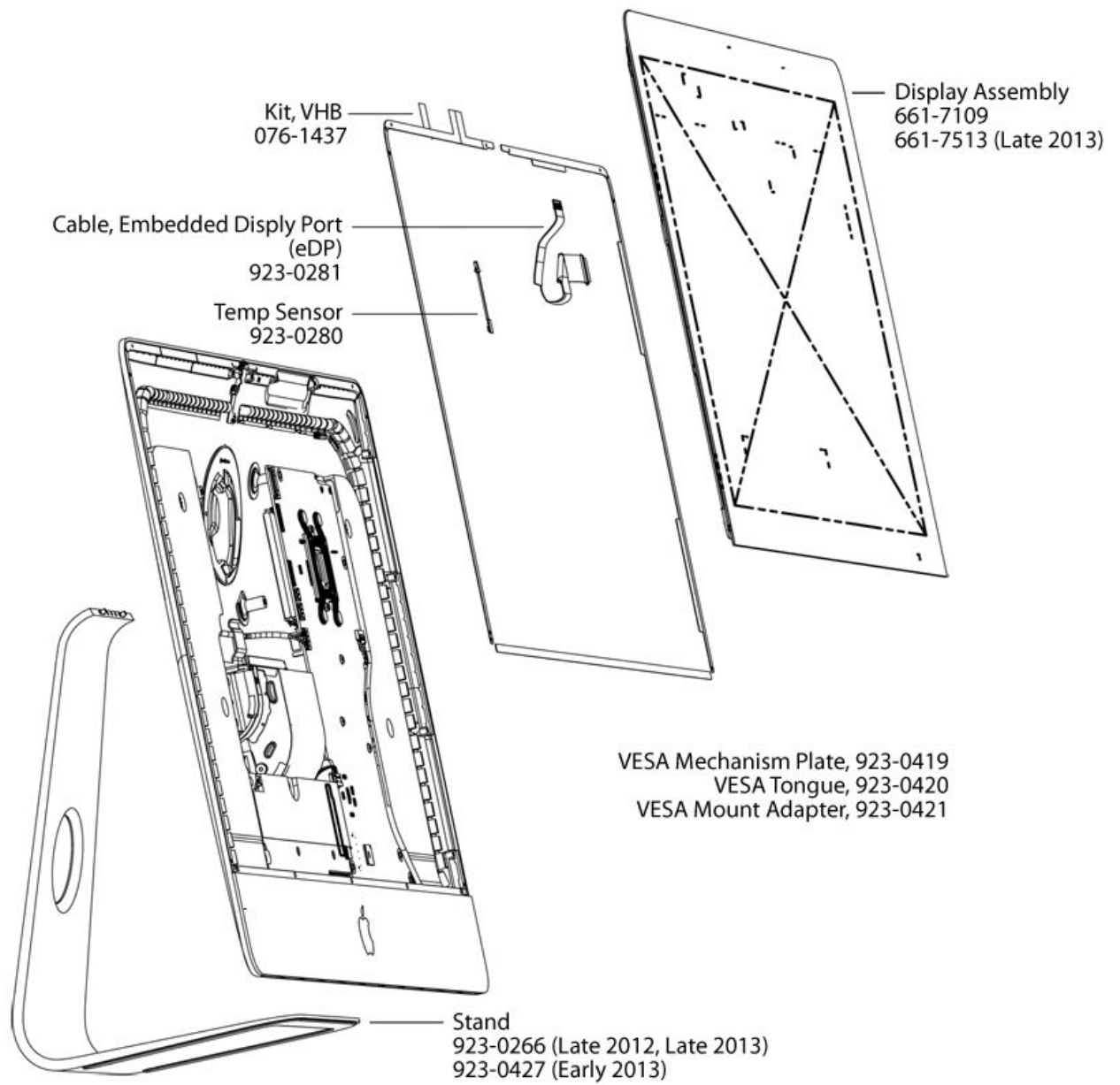
Exploded View #2

iMac (21.5-inch, Late 2012, Early 2013, Late 2013)



Exploded View #3

iMac (21.5-inch, Late 2012, Early 2013, Late 2013)



iMac (21.5-inch, Late 2012, Early 2013, Late 2013): External Views

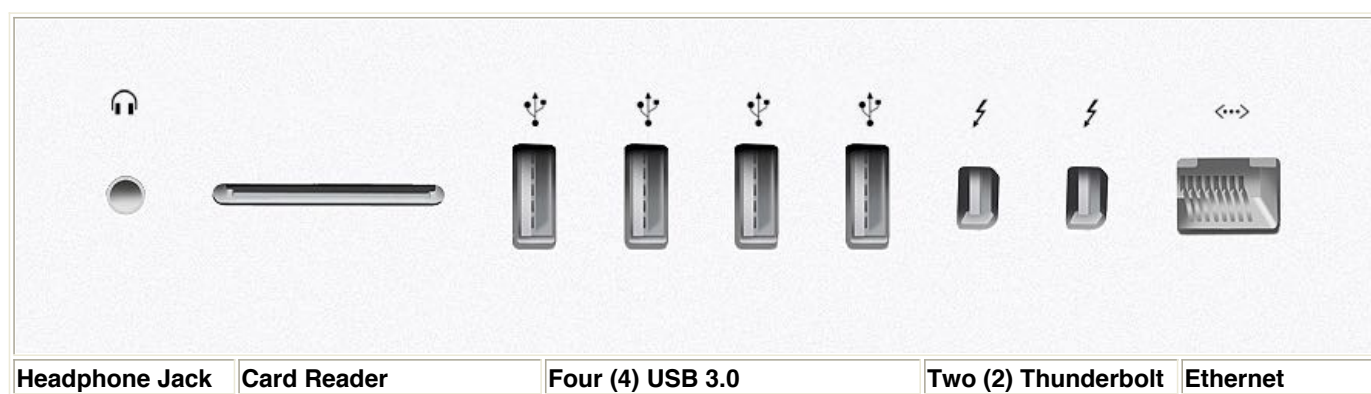
Front View



Rear View



Rear Ports



Headphone Jack

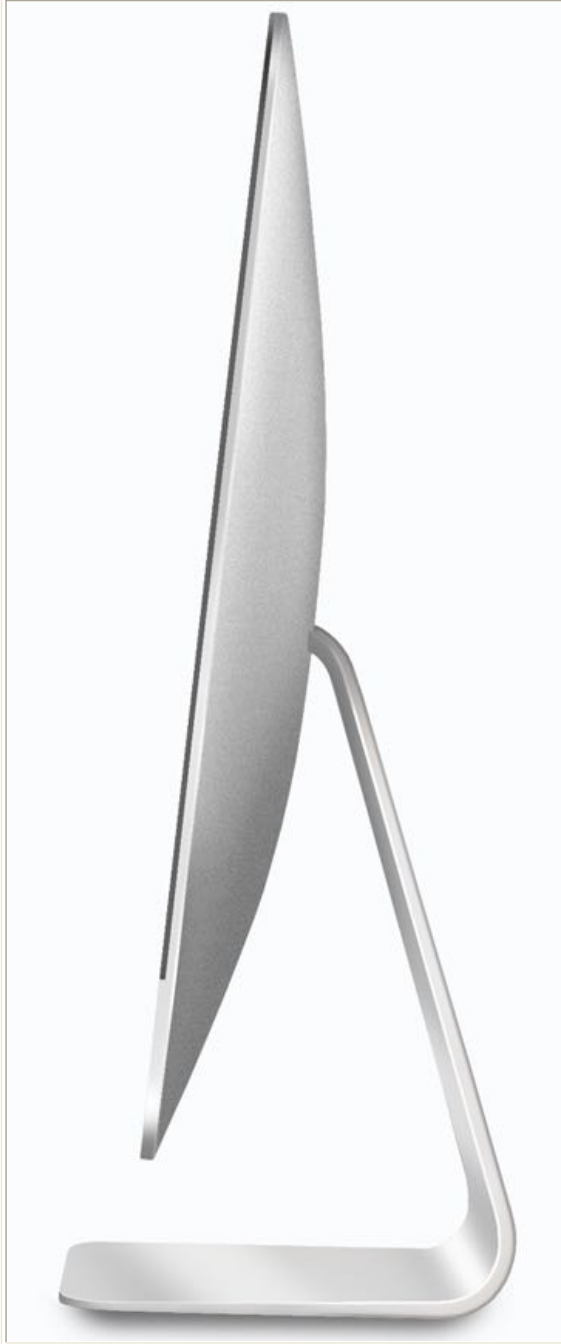
Card Reader

Four (4) USB 3.0

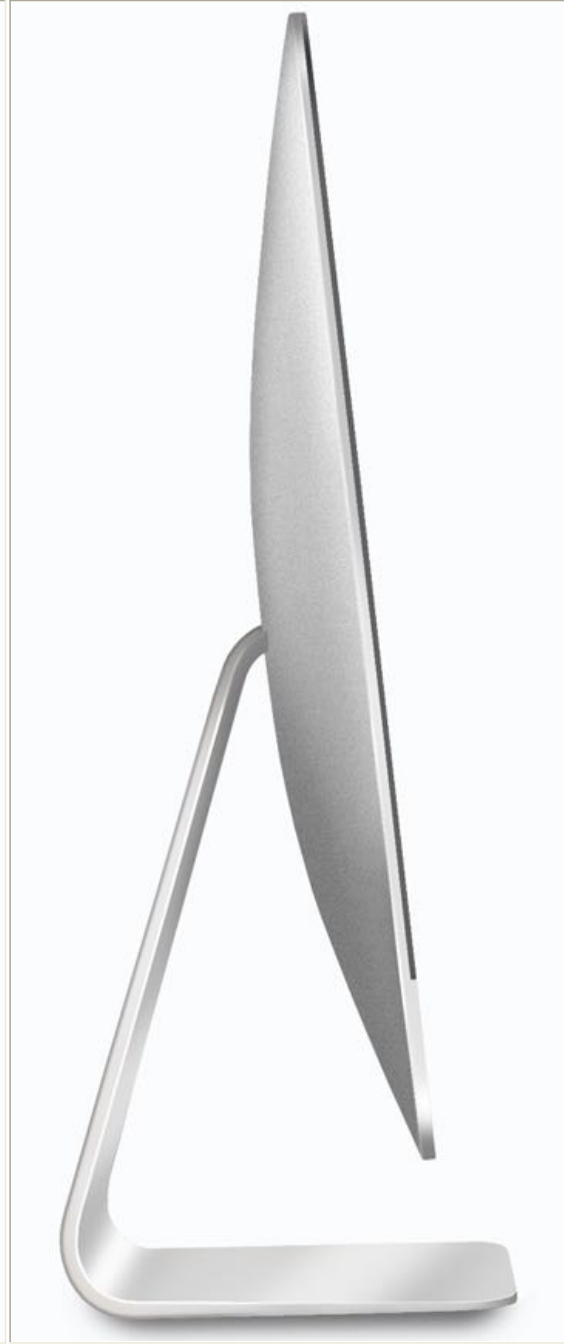
Two (2) Thunderbolt

Ethernet

Side View Right



Side View Left

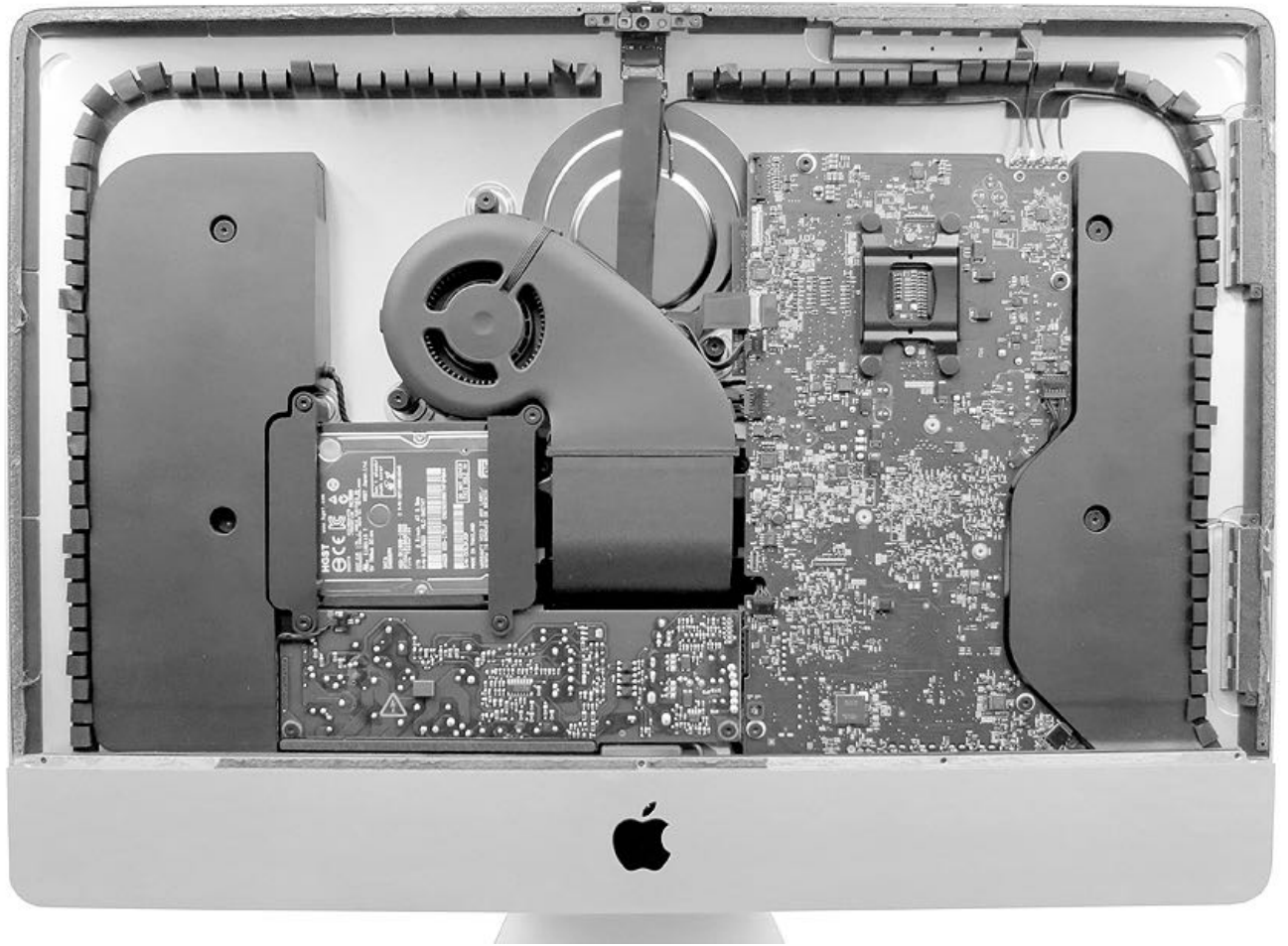


iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Internal Views

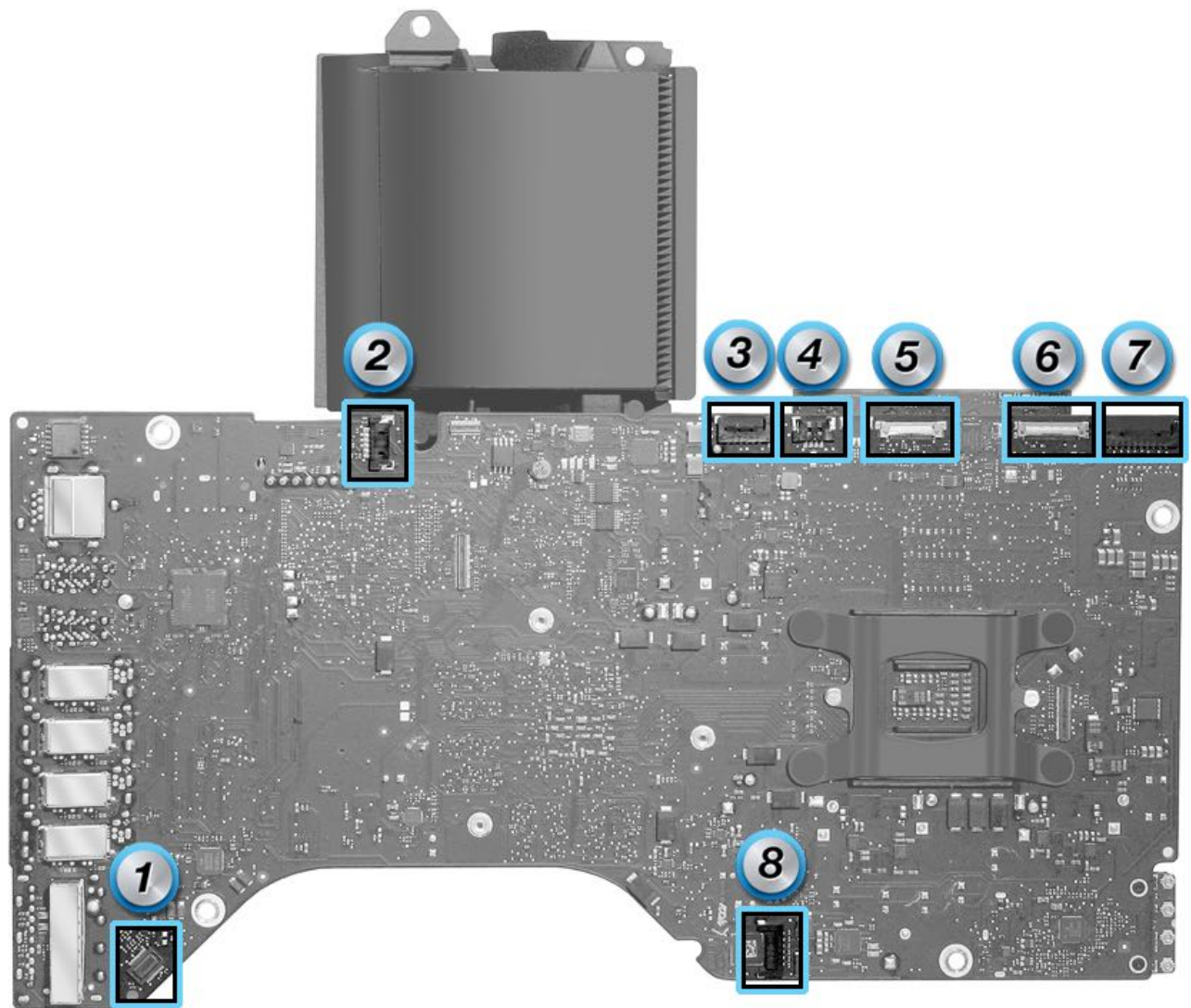
iMac (21.5-inch, Late 2012, Early 2013)



iMac (21.5-inch, Late 2013)



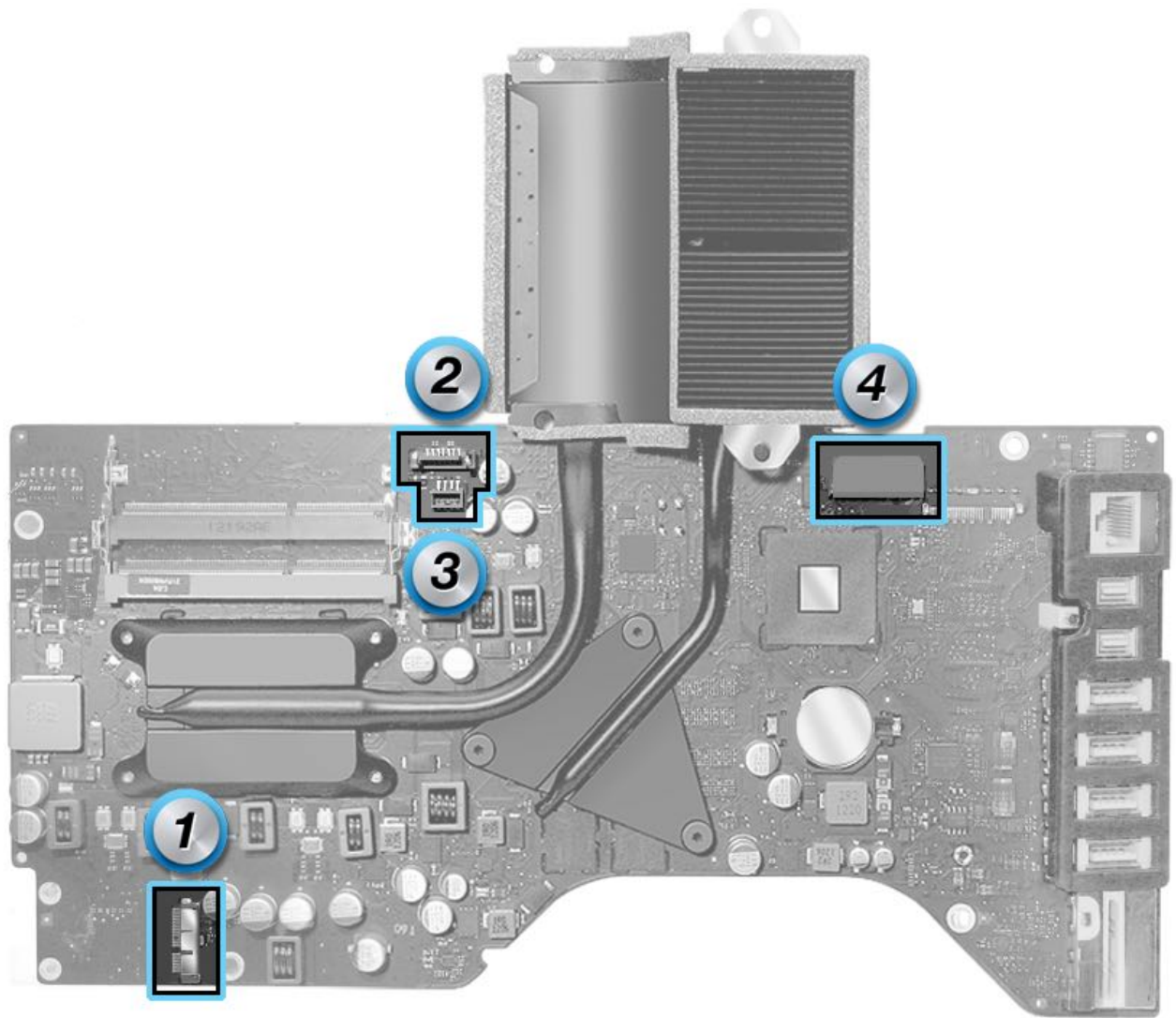
iMac (21.5-inch, Late 2012)



1. Audio jack connector
2. Power supply data cable
3. Left speaker
4. Fan

5. Camera/microphone cable
6. Display panel cable
7. Embedded DisplayPort (eDP) cable
8. Right speaker

iMac (21.5-inch, Late 2012)



1. Wireless card

2. Hard drive data cable













3. Hard drive power cable

4. Power supply power cable

Note: Refer to Apple Support article [TP913: Functional Overview](#) for details on the 3.3GHz, dual-core, iMac (21.5-inch, Early 2013) and iMac (21.5-inch, Late 2013) logic boards.

iMac (21.5-inch, Late 2012, Early 2013, Late 2013): Screw Chart

Note: Screws are not to scale.

923-0332 T10  Fan (3)	923-0339 T4  Camera (2)	923-0335 Phillips 00  Chin Strap - Center (1)
923-0338 Phillips #00  Chin Strap - Sides (4)	923-0324 T10  Hard Drive Bracket (2)	923-0323 T10  Hard Drive Bracket (1)
923-0325 T10  Hard Drive Bracket (1)	923-0333 T10  Right and Left Speaker (1)	923-0327 T10  Heat Sink (Upper Finstack) (2)
923-0336 T10  Heat Sink (Lower Finstack) (2)	923-0337 T4  Wireless Antenna (6)	923-0330 T4  Wireless Card (2)

923-0331 T10  Logic Board, Hard Drive Cradle (5)	923-0329 T8  Stand (7)	923-0334 T10  Mechanism (6)
923-0332 T10  Power Supply (2)	923-0417 Pentalobe  VESA (2)	

Service Guide Feedback

This escalation path is intended only for content issues with Service Guide articles that begin with the prefix IT, RP, SD, SM, SV or TP.

Please provide a clear and concise description of the content issue you encountered and steps to reproduce. Other information that helps us help you:

- Article Number(s)
- Serial Number(s)
- screenshots

Email the **AppleCare Field Service Documentation** team at **smfeedback6@apple.com**.

Note: You may not receive a response, but all comments will be reviewed and investigated as needed.